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PROCEEDINGS

OF THE

Second Meeting of the Animal Husbandry
Wing of the Board of Agriculture and Animal
Husbandry.

Held at Madras from the 14th to the 16th December 1936

WITH APPENDICES



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UNIVERSITY



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AGENDA FOR THE SECOND MEETING OF THE ANIMAL
HUSBANDRY WING OF THE BOARD OF AGRICULTURE AND
ANIMAL HUSBANDRY HELD AT MADRAS FROM THE 14TH
TO 16TH DECEMBER 1936.

VETERINARY EDUCATION.

1. To consider a scheme implementing the recommendations of the Royal Commission on Agriculture to make provision for the training of Indians in India up to the highest standard of veterinary education.
2. To consider the desirability of employing stockmen to supplement the work of Provincial Veterinary Departments in carrying out vaccination, castration and other livestock improvement work, and to make recommendations for the training and supervision of these men.
3. To consider revision of different tables now contained in the Annual Reports of the Directors of Veterinary Services in the various Provinces and constituent States with a view to make them more complete and uniform so as to facilitate their interpretation and the compilation of all-India statistics.
4. To consider arrangements that should be made to enable veterinary students to take up training in dairying at the Central Dairying Institute.

ANIMAL HEALTH.

5. To review the position in regard to the value of the different methods of conferring protection against Rinderpest and to suggest practicable means of extending such work in connection with measures for the improvement of cattle.
6. To review the control measures now being adopted against Haemorrhagic Septicæmia, particularly with reference to the use of anti-serum and vaccine.
7. To review the position of Bovine Mastitis in India and to suggest the effective methods for its diagnosis and control.
8. To discuss effective methods of Prophylactic inoculation against Black-quarter in India.
9. The present position of Equine Encephalomyelitis and Kumri in India.
10. To review the position in regard to the incidence and control of diseases of sheep and goats that are important from the point of view of export of these animals from India.
- 10-A. Establishment of Quarantine Stations at the principal ports of India.
11. To consider improved methods for combating Anthrax in cattle by vaccine instead of serum.

LIVESTOCK IMPROVEMENT.

12. To discuss the provisions of the Bombay Livestock Improvement Act and consider the practicability of introducing them in other parts in India.
13. To discuss co-ordination of cattle improvement measures to give full effect to His Excellency the Viceroy's Scheme.
14. To survey the present position in regard to sheep breeding in India and to make suggestions for its development.
15. To discuss the desirability of introducing cattle dips on a wide scale in India and the type of dip best adapted for use in this country.
16. To discuss the different methods of branding and tattooing animals for purposes of identification.
17. To consider the possibilities of hormone therapy in the treatment of irregularities amongst breeding stock in India.
18. To discuss the practicability of adopting artificial insemination in India.

ANIMAL INDUSTRY.

19. Marketing of livestock and livestock products. (To consider the conclusions of the Livestock Reports of the Agricultural Marketing Adviser.)
20. Selective indigenous breeding *versus* cross breeding with imported poultry for commercial egg production.
21. Grading of hides and skins and the development of the hides and skins industry in India.
22. Salvage of dry cows from city dairying.
23. To discuss the development of the wool and hair industries in India.

ANIMAL NUTRITION.

24. Fodder and fodder resources in India.
25. To discuss the possibilities and results of utilising surplus molasses as cattle feed.
26. To discuss the best methods for co-ordinating the work of the Central Animal Nutrition Section, Izatnagar, and similar institutions in the Provinces and to suggest ways by which the Central Institute could best function as the Central Bureau for dissemination of information.
27. To discuss the control of Equine Abortion in Indian studs, with special reference to the role of minerals in this disease.
28. To discuss the present position of the work in different parts of India on the effect of mineral feeding in dairy animals, from the standpoint of production and prevention of disease.

DAIRYING.

29. To consider whether the time is ripe for the formation of breed and milk-recording societies in India as an aid to developing high milk-yielding strains of the more important Indian breeds of cattle and enhancing the prices of recorded pedigree stock.

- 30. To discuss the correlation of Central Pedigree Herd Books with methods of provincial registration.
- 31. To discuss the importance of buffaloes to the dairy industry and their place in the general agriculture of the country.

SUBJECTS FOR DIRECT AND GENERAL DISCUSSION AT THE FULL MEETING.

- 32. Action taken on the recommendations of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry at its First Meeting held in 1933.
- 33. Report of the progress of the Committee appointed on the recommendation of the First Animal Husbandry Wing Meeting on the question of—
 - (a) All-India Dairy Legislation; and
 - (b) Legislation for Meat Inspection.
- 34. Better utilization of forest areas for grazing.
- 35. The position of Animal Husbandry in India.
- 36. To discuss the employment of unqualified castrators by Government Departments to carry out castration other than under veterinary supervision.
- 37. Sets of formulæ to be employed in connection with experiments on Animal Husbandry and Control of Diseases.
- 38. International conventions relating to trade in Livestock and Livestock products.

38. Mr. D. T. MITCHELL.
39. Mr. A. K. MITRA.
40. Mr. N. P. MOHAN.
41. Lieut. A. A. MONTERIO.
42. Mr. T. MURARI.
43. Mr. R. N. NAIK.
44. Mr. P. N. NANDA (Technical Secretary).
45. Mr. K. R. NARAYANA IYER.
46. Col. A. OLVER.
47. PATTAGAR OF PALAYAKOTTAI.
48. Mr. C. H. PARR.
49. Rao Bahadur C. J. PAUL.
50. Mr. R. D. PAUL.
51. Mr. T. F. QUIRKE.
52. The Hon'ble Mr. P. T. RAJAN.
53. Mr. RAMA RAO.
54. Mr. P. V. RAMAYYA.
55. Mr. W. S. READ.
56. Mr. S. K. ROY.
57. Sir JOHN RUSSELL.
58. Mr. C. B. SAMUEL.
59. Major P. T. SAUNDERS.
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61. Dr. K. C. SEN.
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69. Mr. J. V. TAKLE.
70. Mr. P. K. RAMAKRISHNAN TAMPI.
71. Mr. W. TAYLOR.
72. Rao Bahadur M. VAIDYANATHAN.
73. Mr. HARIDAS MORARJI VETJEE.
74. Mr. A. VISWANATHA IYER.
75. Mr. G. R. VISWANATHAN.
76. Mr. F. WARE.
77. Mr. T. A. WHITEHEAD.
78. Dr. N. C. WRIGHT.

N. C. MEHTA, I.C.S., *Secretary.*

The meeting lasted from 11 A.M. to 1-0 P.M.

2. In welcoming H. E. the Governor of Madras, Sir Bryce Burt said:—

“To me falls the very pleasant duty of welcoming H. E. Lord Erskine, Governor of Madras, to the Second Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India. On behalf of all members of the Board, I desire to thank H. E. for finding time amongst his numerous other engagements to be with us today. We greatly appreciate this token of H. E.’s personal interest in the improvement of livestock. We are also glad to see with us the Hon’ble Mr. Rajan, Minister-in-Charge of the portfolio of Agriculture in the Madras Presidency and Mr. Paul, Secretary to the Government of Madras, Development Department.

It is also my privilege to thank H. E.’s Government on your behalf for their kind invitation to hold this meeting in Madras, for the facilities which they have placed at our disposal both for our meetings and for visits to various centres of animal husbandry work in the Madras Presidency and for the hospitality shown to us. This is only the second meeting of the Animal Husbandry Wing and it is in every way appropriate that the first meeting to be held outside Delhi should take place in the Madras Presidency. There are still some of us who remember the very successful meeting of the original Board of Agriculture which was held at Coimbatore in 1913 in the early days of the Agricultural Department.

It is now my privilege on your behalf to ask His Excellency the Governor to open your proceedings”.

3. H. E. the Governor of Madras, in opening the proceedings of the Board, made the following speech:—

GENTLEMEN,

It gives me great pleasure to offer you a cordial welcome to Madras, and I trust that your visit to this city of historic and academic associations will be as pleasant as I am sure it will be profitable. I would extend a particular welcome to our visitors, Sir John Russell and Dr. Wright, and tell them how glad we are that they are here to contribute their wide knowledge and experience to these discussions.

As most of you are aware, these Animal Husbandry Wing meetings of the Board of Agriculture have been instituted as a result of the advice of the Royal Commission on Agriculture, and from the note which is being submitted to you as to the action which has been taken on the recommendations made at your first meeting it is clear that considerable advance has thereby been made within the short space of three years in the development of Animal Husbandry in this country. There is an immense amount of work yet to be done, but the way to getting it done has at least been paved by the steady progress which has of late years been made in the directions of research and training at the centre. For instance, the Imperial Veterinary Research Institute, Muktesar, has been organised into sections, each under a qualified research officer, expert in his subject, and the staff and facilities available at this Institute have been

strengthened to enable it to deal more adequately with the myriad problems of the diseases to which livestock in this country are subject. Provision is also being made at Izatnagar, the Sub-station of the Imperial Veterinary Research Institute, for animal nutrition research, research into poultry diseases and a Poultry Institute, and proposals are under consideration for the establishment there of a section of Animal Genetics and an All-India Veterinary College for imparting training up to the high standard which is now demanded from veterinary officers in all advanced agricultural countries. And when these proposals have been implemented, India should have ample facilities for research and training in all branches of Animal Husbandry.

The stage is thus set for a great stride forward, and India is indeed fortunate to have at this juncture in the person of her Viceroy one who is so actively interested in seeing to it that that stride is taken. As you know, one of His Excellency's first acts on assuming office was to demonstrate in a very practical manner his sense of the great importance to the prosperity of the Country of livestock, and of cattle in particular, by presenting pedigree bulls for the improvement of cattle in Delhi Province; and his example has since been widely followed by many public-spirited gentlemen elsewhere. More than that, however, the Viceroy has succeeded in focussing public attention on this vital matter to such an extent that comprehensive action must necessarily follow. Here in Madras it must be confessed that the Governments of the past have taken all too little interest in animal husbandry but we may at least claim that we have now awoken to our responsibilities and have under consideration various schemes which will, it is hoped, result in a real improvement in the condition of the livestock of the Presidency in the near future. What is required, and has hitherto been largely lacking, is an expert animal husbandry organisation to carry on scientific breeding-control in the villages, and the Government are now considering how best this can be brought into being, including the question of the advisability of transferring the livestock section to the control of the Veterinary Department. An expert has been placed on special duty to work out the details of several new cattle farms which it is proposed to start; and meanwhile we are doing what we can to encourage the purchase and maintenance of good breeding bulls by individuals and institutions, such as District Boards and Co-operative Societies, by extending the system of Government contributions. To one thing we may point with pride, namely, that Madras is the only Province to possess its own Serum Institute, and this Institute is now proposing to add to the number of cattle diseases against which it has been waging effective warfare. Your deliberations, coming at this juncture, will thus be of the greatest value and assistance to my Government, and as a result of the powerful incentive to further advance in matters agricultural which the Viceroy has supplied, there is every reason to anticipate that your recommendations will bear fruit more easily and rapidly than has been possible hitherto.

I am particularly interested to see that on this occasion, special arrangements have been made to discuss in all its bearings the conservation and development of the natural grazing resources of the country. This is a subject on which the Royal Commission has laid much stress, and one which is very material to this Presidency, since forest grazing areas are an important factor in Madras in enabling breeders to rear and maintain cattle at low cost.

While the problem of the better utilisation and conservation of these natural resources is of great importance, I would like also to refer to another aspect which is bound to loom large in the future, namely, the production of a cheap and more adequate supply of milk and dairy products for the better nutrition of the people. This is a matter in which I regret to say the Madras Presidency is deplorably backward. Medical opinion is now unanimous and insistent that milk and dairy products constitute the most valuable of all the protective foods and form an integral part of a well-balanced dietary. Yet according to such information as is obtainable the total *per capita* consumption of milk in the Madras Presidency, in the form of liquid milk and of dairy products of all kinds, hardly amounts to more than about 3 oz. per day, whereas in Great Britain and the United States of America the average is approximately 11 oz. and 17.5 oz. respectively, and it is recognized that even these amounts are not enough. Moreover, it has recently been shown very clearly, in India as well as in numerous other countries, that the addition of comparatively small amounts of either whole or skimmed milk to the diet of school children has a marked effect on their development and general well-being.

In providing for the production of working cattle needed for ordinary agricultural operations the necessity for at the same time producing more milk and of reducing the large number of unprofitable cattle maintained at present should, therefore, not be overlooked. In Madras a very good example is provided by the famous Ongole Breed of how, with suitable feeding and management, these requirements can to a large extent be met by the rearing of high grade cattle under semi-stall fed conditions, and it is of great interest that breeders of such an essentially working type cattle as the Kangayam and the Amrit Mahal, in the breeding of which attention has in the past been almost exclusively confined to working capacity are now paying more attention to milk production.

It is hardly necessary to remind a body such as this that it is not generally possible to produce high grade stock, whether for milk or for work, on grazing alone, and that to produce more milk or better working cattle it is necessary and profitable to provide concentrates or specially grown fodder to supplement or replace such grazing as is available. It is known that agriculturists could in this way make a steady cash income from milk, in addition to producing valuable working bullocks. The growing of fodder crops as well as the development and conservation of natural grazing is thus a matter of the greatest importance to India. Nor must it be forgotten that there are other classes of livestock which deserve more scientific attention than has been paid to them in the past and it is also true that proper marketing of animal products is essential if the maximum of benefit from India's enormous reservoir of livestock is to accrue to the people. I am glad to see that these aspects of Animal Husbandry development are not being neglected in your discussions.

May I, in conclusion, tell you how gratifying it is to me that a body of experts such as the Animal Husbandry Wing should meet here at Madras. I thank you for the honour you have done me in inviting me to open your Conference and wish you a happy and fruitful session, for your deliberations are fraught with importance to the welfare of this vast country.

4. *Better utilization of forest areas for grazing—Report on the preliminary conference [subject 34 of the agenda. Appendices XXX (a) to (c).]*

Mr. Whitehead introduced the report [Appendix XXX (d)] of the conference and gave a summary of the principal recommendations.

Colonel Olver considered the report a most valuable one which indicated clearly lines along which much could be done to implement the wishes of the Viceroy in regard to the improvement of cattle. He was particularly interested to see that the members of the Committee agreed very closely with the opinions which he had himself formed that forest grazing was really of minor importance compared with the problem of making better use of waste lands. His observations had convinced him that from the Ongole tract in the south to the Bhagrari and Dhanni tracts of the north, all the best cattle of India were produced in areas where growth of grass was scarce. This was due to the poor quality of grass produced in forests and to the fact that cattle owners in dry areas were forced to supplement such grazing as was available by fodder crops or concentrates while grazing in forest areas was not usually accessible to cultivators who were in a position to produce the necessary supplementary crops; e.g., in Bhopal there were large areas of what appeared to be excellent grazing and large numbers of cattle were produced under forest conditions but their average value was not more than Rs. 10 and the cultivators had to buy their work cattle at high prices from the neighbouring drier districts of Gwalior State. Recently while motoring through a certain area in the southern portion of Bombay Presidency, he had noticed that the cattle seen grazing alongside the roads were of low value—their average value delivered in Bombay is only about Rs. 15 yet the bullocks working in the ploughs were very fine and he had ascertained that these were now mostly bred in some of the special breeding areas under Government control whereas formerly they were purchased at high prices in Mysore. He was sure that Mr. Bruen would agree that these fine bullocks had not been produced on grass alone but it was nevertheless true that to produce high class working cattle one must have grazing facilities within easy reach of the areas in which they were reared. In irrigated areas, there was a great tendency for cattle to degenerate from the working point of view and it might be found necessary in such areas to go to drier tracts where cattle are bred under healthier conditions for their sires but generally irrigated areas would be more suitable for the production of dairy than work cattle. The main problem however was to provide better nourishment for the bulk of the cattle of the country, and one way of doing this was to provide better grazing areas easily accessible to village breeders. But it was essential that fodder crops or concentrates should also be provided if stock of real value for work or for milk, were to be produced.

Dr. Burns briefly traced the history of previous work on the subject and was of the opinion that it had been spasmodic and unorganised. The present scheme was a sound one but he suggested that provision should be made for the inclusion of an agriculturist and a botanist on each provincial Grazing Committee.

Mr. Parr wanted further detailed study of the grazing areas to be made and referred to the absence of proper management of what is commonly known as cultivable waste. He would recommend more grassland research and that the better methods of management of grazing areas resulting from the research should be enforced by law. In his view the proposals.

made by the Committee though they covered the terms of reference were inadequate since it had concerned itself mainly with forest land which represented only 3 per cent the total grazing areas. He stated that it was well known that the best land is always taken up for crop production, and that in his view the type of cattle generally produced in a tract was a reflection of the quality of the land but that there was considerable scope for improving the production and quality of pasture on all grazing areas and comprehensive research work should be instituted to indicate the methods to be adopted.

Mr. Kerr wanted the problem to be studied area by area. A heavy rainfall did not necessarily imply good grazing. In Bengal the worst cattle were produced in the areas where most grazing was available and he wished to emphasize the necessity for producing more fodder crops and for more staff to carry on systematic breeding control and castration.

Rai Bahadur B. M. Das gave his opinion that it would be a great thing if a little of the area used for jute cultivation was reserved for grazing purposes seeing that attempts are being made by the Government of Bengal to restrict jute crops to raise the price of jute.

Mr. Quirke welcomed the proposals of the Committee particularly that relating to the formation of provincial grazing committees. He explained that the Punjab was suffering from the effects of unrestricted grazing in forest areas which he held was a temptation to keep a large number of cattle of low value, increasing the number of uneconomic animals in the Province. He suggested that this point should be kept in mind.

Mr. Harlow stated that in the Committee they had concentrated mainly on Government waste, *e.g.*, the raiyatwari tracts of Madras and Bengal. He considered that legislation was required. As regards growing fodder crops and giving up grass, he stated that the backward tribes, amongst whom he had worked in the C. P., had not enough food for themselves, and therefore it would be impossible to give up land for fodder when there was not enough for human food.

Mr. Ware considered the report to be a very valuable one. There were already sanctuaries for wild animals; and he suggested that sanctuaries should be formed for domestic animals in forest areas. An enormous amount of grazing is available in India; but is being wasted at present. There was need for improvement of water supply and legislation for restricting the numbers of cattle admitted to grazing areas. One of the bug bears of forest grazing had been contagious disease, particularly rinderpest, but there was no need nowadays for any animal to die of this disease, and it should in his opinion be arranged that no animal not protected against rinderpest should be allowed in forest grazing areas. Before issue of passes, the Forest Department should consult the Veterinary Department with a view to ensure that all scrub animals would be castrated. This might be effected by charging an increased grazing fee for male animals over a certain age. He supported the formation of provincial committees and hoped that after their reports had been received a concerted plan of work would be prepared.

Mr. Bruen doubted whether grazing in India was of any value. It lasted only four months in the year and his own experience was that where grazing was good, the cattle were poor because people relied too much on it and expected it to last the whole of the year. In his opinion no land should be given to any one purely for grazing purposes. It should

be given only on the condition that silage and hay would be made during the early months of the monsoon from a portion of the land, before cattle were allowed to graze on it.

Sir John Russell pointed out that other countries had, within a short space of time, made considerable improvements in their grazing areas either through soil improvement or plant improvement and he felt sure that India could do the same though the difficulties were great. The methods adopted might vary in each country and he instanced Australia, New Zealand and South Africa, where manuring, provision of mineral licks or the introduction of new grasses respectively had improved the cattle industry enormously. If the problem was properly tackled in India, there was no reason why the difficulties now encountered should not be overcome in course of time.

Dr. Wright emphasised the fundamental importance of fodder and grazing.

Mr. Read, in reply to the suggestion made by Dr. Burns, said that the words botanist or agriculturist were left out of the constitution of Provincial Committees as it was felt that when taking up any particular problem the Committee would co-opt botanists, chemists, agriculturists, etc., as found necessary.

Recommendations (1), (2) and (4) of Part I of the report were adopted. In recommendation (3) the Board desired that the word "must" in the last sentence should be changed into "should" and this was agreed to by Mr. Whitehead.

Recommendation (1) of Part II of the report was adopted. As regards recommendation (2), it was agreed that a botanist and an agriculturist should also be made members of the proposed provincial committees, and that a veterinary officer also should be included if the animal husbandry officer did not possess the requisite veterinary qualifications.

A list of members of the various sub-committees as approved by the Board is appended.

The meeting then adjourned till 10-00 A.M. on Wednesday the 16th December 1936 to allow the various sub-committees to meet in the meantime.

S. K. DATTA,

P. N. NANDA,
Secretaries.

APPENDIX.

LIST OF MEMBERS OF SUB-COMMITTEES.

Live-stock Improvement Sub-Committee—

Col. A. OLVER (*Chairman*).
 Mr. RAMAKRISHNA AYYAR.
 Mr. K. P. R. KARTT.
 Mr. R. W. LITTLEWOOD.
 Dr. T. J. MIRCHANDANI.
 Mr. R. N. NAIK.
 Mr. P. N. NANDA (*Rapporteur*).
 PATTAGAR OF PALAYAKOTTAI.
 Mr. WYNNE SAYER.
 Mr. C. H. PARR.
 Mr. T. F. QUIRKE.
 Rai Bahadur DADU DAWARKANATH SINGH.
 Mr. N. CHATTERJEE.
 Lieut. A. A. MONTERIO.

Animal Health Sub-Committee—

Mr. P. J. KERR (*Chairman*).
 Mr. S. C. A. DATTA (*Rapporteur*).
 Mr. J. S. GAREWAL.
 Mr. K. KRISHNA IYENGAR.
 Mr. SUBRAMANIA IYER.
 Mr. E. O. LONGLEY.
 Dr. H. K. MEHRA.
 Mr. C. S. MURTY.
 Mr. R. N. NAIK.
 Mr. K. P. PILLAI.
 Mr. J. F. SHIRLAW.
 Mr. P. K. TAMPI.
 Mr. G. R. VISWANATHAN.
 Mr. S. D. ACHAR.
 Mr. J. H. G. JERROM.
 Mr. BALWANT SINGH.

Animal Industry Sub-Committee—

Mr. C. B. SAMUEL (*Chairman*).
 Mr. KATLASAM IYAR (*Rapporteur*).
 Capt. B. R. BINGLEY.
 Mr. E. J. BRUEN.

Animal Industry Sub-Committee—contd.

Rai Bahadur B. M. DAS.

Dr. SUNDARA RAJ.

Mr. W. S. READ.

*Animal Nutrition Sub-Committee—*Dr. P. F. LANDER (*Chairman*).

Dr. W. BURNS.

Mr. T. A. WHITEHEAD.

Mr. M. I. MALIK.

Rao Bahadur D ANANDA RAO.

Mr. H. B. SHAHI.

Dr. K. C. SEN (*Rapporteur*).

Mr. P. VENKATARAMAYYA.

*Veterinary Education Sub-Committee—*Mr. F. WARE (*Chairman*).Capt. A. C. AGGARWALA (*Rapporteur*).

Mr. E. S. FARBROTHER.

Mr. T. J. HURLEY.

Sir BRYCE BURT.

Mr. RIAZ-UL-HASAN.

Mr. S. K. SEN.

Mr. W. TAYLOR.

*Dairying Sub-Committee—*Mr. ZAL R. KOTHAVALLA (*Chairman*)

Mr. S. K. ROY.

Major P. T. SAUNDERS.

Dr. N. C. WRIGHT.

Mr. J. V. TAKLE.

REPORT OF THE SUB-COMMITTEE ON VETERINARY EDUCATION.

MONDAY, THE 14TH DECEMBER, 1936, AND TUESDAY, THE 15TH DECEMBER, 1936.

MEMBERS PRESENT :

Sir BRYCE BURT.

1. Mr. F. WARE (*Chairman*).
2. Captain A. C. AGGARWALA (*Rapporteur*).
3. Mr. E. S. FARBROTHER.
4. Mr. T. J. HURLEY.
5. Mr. K. P. R. KARTHA.
6. Mr. D. T. MITCHELL.
7. Mr. RIAZ-UL-HASSAN.
8. Mr. S. K. SEN.
9. Mr. W. TAYLOR.

The Committee on Veterinary Education met on the 14th December at 2-30 P.M. to consider and make recommendations on items 1 to 3 of the Agenda. It had previously been announced by the Vice-Chairman that item No. 4 would be jointly considered with the Sub-Committee on Dairying. Only two Principals of Veterinary Colleges, *viz.*, Lahore and Madras, were present but the views of the Principal of the Calcutta College were circulated in the form of a note which he had submitted in reference to Subject No. 1, and the Director of Veterinary Services, Bombay, was also present.

Subject No. 1.—To consider a scheme implementing the recommendations of the Royal Commission on Agriculture to make provision for the training of Indians in India up to the highest standard of veterinary education. (Appendix I.)

The Chairman in introducing the subject informed the Committee that the scheme in its present form had already been presented to the Government of India and what was now needed was to consider it with a view to suggesting any revision considered necessary. Sir Bryce pointed out that the Government of India had not committed themselves in any way in this connection.

The Chairman traced the history of Veterinary Education in India and briefly summarised the basic ideas followed by the authors of the note in formulating this scheme for setting up a new Central Veterinary College meant to impart better and advanced veterinary training to a standard approximating that of the M.R.C.V.S. in Great Britain. He pointed out that to begin with, about ten graduates could be turned out every year from this Institution, and this was estimated to be the demand, if the sympathies of the Army could be enlisted. After a lively discussion on the question of dual standard of veterinary education in India, *viz.*, provincial for manning the subordinate ranks and central for turning out officers for the gazetted ranks, it was agreed that—

- (1) a course of instruction upto the highest standard of veterinary education is necessary in India;
- (2) a separate Central College should be built and equipped for this purpose; and that

- (8) this College should be located at Izatnagar in consideration of the manifold facilities that the place provided.

After the word "equivalent" in para. 4 of the Note it was agreed to add the words "(with subjects—Organic and Inorganic Chemistry, Physics and Biology)", and the following sentence was added after the word "Central College" in line 4:

"Preference should be given to graduates in the aforesaid subjects."

In regard to the curriculum proposed in the note, the general principle of the group system of subjects was approved by the Sub-Committee on grounds of economy in the number of professorial chairs, building accommodation and for maintaining continuity of thought on the part of professors, lecturers and students.

It was further agreed that:

- (1) the recruitment to the Central College from the Provincial College would not be less than one student per college per annum if suitable candidates were available;
- (2) that in the case of those provincial colleges desiring recognition, it would be necessary for the subjects, included in the first two years enumerated in appendix C, to be included in the first two years curriculum of the provincial colleges. The distribution of the subjects in a modified form included in the third, fourth and fifth years in appendix C in the final year or years of the provincial colleges should be left to the discretion of the officers concerned; and
- (3) that in appendix C in first year, the word 'Osteology' should be changed to 'Elementary Anatomy' and in the third year 'Anatomy of the Domesticated Animals' should read 'Advanced Anatomy'.

For the purpose of investigating the suitability and standard of the teaching staff and examination of those colleges applying for recognition, it was recommended by the Sub-Committee that it would be necessary for the Government of India to appoint a small Committee for the purpose which should include the Animal Husbandry Experts of the Imperial Council of Agricultural Research, the Principal of the Central College and one other Veterinary Officer.

It was felt by the Sub-Committee that it is desirable to obtain recognition of the R. C. V. S. and to that end, it would be necessary to bring out at least one officer from Great Britain annually to inspect the Central College and to take part in the examination.

Subject No. 2.—To consider the desirability of employing stockmen to supplement the work of Provincial Veterinary Departments in carrying out vaccination, castration and other live-stock improvement work, and to make recommendations for the training and supervision of these men (Appendix II).

Mr. Taylor in introducing the subject explained that the object of presenting this paper was to suggest a means of increasing the personnel of the existing veterinary staffs without undergoing any great expenditure by extending the range of duties of the present-day compounders and dressers by revising their course of training.

The following were considered to be the duties which such men might perform :

- (1) Dressing and compounding.
- (2) Castration.
- (3) Treatment of simple and minor ailments.
- (4) Rendering assistance in vaccination and inoculation work.
- (5) Registration of pedigree stock including tattooing and branding of animals.
- (6) Collection of specimens and demonstration in field work connected with special investigations.
- (7) Work in connection with dipping operations.
- (8) Propaganda work in connection with general sanitary conditions, flaying of carcasses, etc.
- (9) Generally to advise the village folk on the care and management of animals.

The Sub-committee recognised that in those provinces where the touring veterinary staff had not been developed and was inadequate it might be desirable to appoint a large number of such men, for whom the term 'Field Compounder' is suggested.

With regard to the basic qualifications of these field compounders it was not considered necessary for them to be matriculates. The question as to whether the course of training should be given in provincial vernacular or English was left entirely to the discretion of the provincial Governments, but it was considered very desirable that they should know enough English to be able to read and write labels and other ordinary things. It was also agreed that it is very desirable that these men should be recruited from amongst the agricultural classes, with an interest in live-stock.

The rates of pay, would vary in different provinces but the scale of Rs. 25—1/2—35 might be suitable and the service should be non-pensionable.

It was further recommended by the Sub-Committee that the course of training should extend over a period of six months and that this training could be carried out either at the provincial Veterinary Colleges or at large district hospitals, whichever was found more convenient.

Subject No. 3.—To consider revision of different tables now contained in the Annual Reports of the Directors of Veterinary Services in the various Provinces and constituent States with a view to make them more complete and uniform so as to facilitate their interpretation and the compilation of all-India statistics (Appendix III).

The Sub-Committee after full consideration of the paper presented by Mr. Kartha made the following recommendations:—

1. It is desirable, for the purpose of collecting all-India Statistics, that the tables appended to the Annual Reports of the Provincial Veterinary Departments should be uniform.
2. In future the tables should be arranged in the order in which they are shown in Mr. Kartha's note.

3. In Table I, for 'Other Diseases', substitute 'Other contagious and parasitic diseases'.
4. The 'N.B.' at the bottom of table I should be deleted.
5. The tables II, III, IV, V and VII should be accepted as approved in the form suggested in the note.
6. In tables VI-A, VI-B and VI-C, it would be necessary to add another column headed 'Others' in order to include gift and privately owned approved animals.

Regarding the table for statistics of livestock slaughtered it was recognised that in certain provinces some difficulty would be experienced in collecting the required data, but an attempt should be made to obtain these figures as correctly as possible. Although it was considered desirable to obtain figures regarding the number of carcasses condemned in the slaughter houses as well as to state the causes of such condemnations, the Sub-Committee considered that it would be difficult at this stage to obtain even the approximate figures.

The 3 tables dealing with (i) cost of Civil Veterinary Departments analysed under various heads, (ii) Strength of staff employed and how they are distributed, and (iii) results of Colleges, which are already included in the Annual Reports of the Provincial Veterinary Departments should be renumbered as Tables IX, X and XI.

Further it was considered that the inclusion in the Annual Reports of any statements showing the working results of live-stock farms or special experiments or investigations should be left to the discretion of the provinces concerned and when included they should be placed after Table XI.

Subject No. 4.—To consider the arrangements that should be made to enable Veterinary students to take up training in dairying at the Central Dairying Institute.

This subject was discussed jointly with the members of the Sub-Committee on Dairying in the afternoon session commencing at 2-30 P.M. on the 15th December, at which the following were present:

Dr. N. C. WRIGHT.
 Mr. F. WARE (*Chairman*).
 Captain A. C. AGGARWALA (*Rapporteur*).
 Mr. E. S. FARBROTHER.
 Mr. T. J. HURLEY.
 Mr. ZAL R. KOTHAVALLA.
 Mr. RIAZ-UL-HASSAN.
 Mr. P. T. SAUNDERS.
 Mr. S. K. SEN.
 Mr. W. TAYLOR.

The joint committee laboured under considerable difficulty in dealing with this subject as it was not in possession of the detailed syllabus of Part I of the proposed dairy course and it was therefore felt that final consideration of the matter might be deferred until such time that it was made available.

Captain Aggarwala then read out the relevant portions bearing on the discussion of the subject from the Proceedings of the Special Sub-Committee for I. D. D. Courses appointed by the I. C. A. R. held at Simla, on 15th July, 1936. After taking into consideration the subjects in which it is contemplated that students will be given instructions in the first part of the I. D. D. course, it was felt that under existing conditions at the provincial Veterinary Colleges, even if a dairy were added to the facilities, it would be difficult to add instruction in technical dairy processes included in Part I of the proposed dairy course to an already over-loaded Veterinary Syllabus.

It was suggested that it might be more advantageous to draw up the syllabus of Part I of the new course in such a manner that it would fit in more easily with the existing courses of instruction at the different veterinary and agricultural colleges in India, so that the better type of persons equipped with basic veterinary and agricultural knowledge would be attracted to take up the Second Part of the I. D. D. course.

It was pointed out that, in any case, if veterinary colleges were to provide instruction in Part I of the course, it would be necessary for them to be provided with a suitably equipped dairy and in the meantime, veterinary graduates requiring instruction in dairying could, under the existing rules, take up certain post-graduate courses at the Central Dairy Institute.

REPORT OF THE SUB-COMMITTEE ON ANIMAL HEALTH.

MONDAY, THE 14TH DECEMBER 1936, AND TUESDAY, THE 15TH DECEMBER 1936.

MEMBERS PRESENT:

Mr. P. J. KERR, (*Chairman*).

Mr. S. C. A. DATTA, (*Rapporteur*).

Mr. J. S. GAREWAL.

Mr. K. KRISHNA IVENGAR.

Mr. A. SUBRAMANIA IYER.

Mr. F. O. LONGLEY.

Dr. H. K. MEHRA.

Mr. D. T. MITCHELL.

Rai Sahib S. C. GHOSE.

Mr. R. N. NAIK.

Mr. M. I. MALIK.

Mr. J. F. SHIRLAW.

Mr. P. K. TAMPI.

Mr. G. R. VISWANATHAN.

Mr. S. D. ACHAR.

Mr. J. H. G. JERROM.

Mr. BALWANT SINGH.

...

Subject No. 5.—To review the position in regard to the value of the different methods of conferring protection against Rinderpest and to suggest practicable means of extending such work in connection with measures for the improvement of cattle.

Principle recommended for the application of Goat virus in the control of Rinderpest.

(1) In the face of outbreaks only to control the disease with reservations for improved stock.

(2) For the control of outbreaks but for systematised prophylaxis also, such as the establishment of immune blocks.

Here again opinion was divided and the risk was emphasised of creating herds, which as a result of being screened from natural rinderpest for a period of years of unusually high susceptibility.

It was felt that further experience of the results of permanent immunity against rinderpest was necessary prior to forming an opinion either way.

Subject No. 6.—To review the control measures now being adopted against Haemorrhagic Septicaemia, particularly with reference to the use of anti-serum and vaccine. (Appendix IV.)

Vaccine therapy versus serum in the control of Haemorrhagic Septicaemia.

Opinions, or rather experience in this matter appeared equally divided between the efficacy of the use of vaccine alone and serum alone to control outbreaks.

As a prophylactic to prevent outbreaks where this is possible vaccine is the only method but again opinions were divided as to its real value.

It was agreed that a more potent vaccine conferring more lasting immunity was desirable, but doubts as to its ever being evolved were submitted by Mr. Shirlaw. He suggested that better results might be obtained by concentration on various strains. His suggestion for compromise was agreed to. That outbreaks should be treated individually acute fulminating outbreaks being treated with serum and less acute and more scattered ones with vaccine. He also suggested that vaccines for allied tracts from the tract strain might be made and give better results.

From the discussion it also transpired that the present methods for evaluating the efficacy of either serum or vaccine treatment of outbreaks were not satisfactory as the disease had a tendency to work itself out and this vitiated the successful result claimed for either method.

Subject No. 7.—To review the position of Bovine Mastitis in India and to suggest the effective methods for its diagnosis and control. (Appendix V.)

The loss caused by mastitis among Dairy cattle and goats in India is recognised, but to what degree it prevails is not definitely known.

Further investigation is required provincially. Diagnosis in the first instance should be made provincially. In particular the incidence of tubercular mastitis calls for further investigation. Information of the routine methods of differential diagnosis should be circulated by the Institute.

Subject No. 8.—To discuss effective methods of prophylactic inoculation against Black-quarter in India. (Appendix VI.)

As a result of discussion it transpired that much more accurate diagnosis of each outbreak than is at present available is necessary. This should be carried at provincial laboratories and confirmed by the Central Institute. Early appointment of an officer to Imperial Veterinary Research Institute with special training in anaerobic work is urgently needed. Mapping of enzootic areas in provinces according to the casual organisms should be carried out. Specific prophylactic inoculation be adopted as far as possible.

Subject No. 9.—The present position of Equine Encephalomyelitis and Kumri in India. (Appendix VII.)

Mr. Shirlaw summarised the present position and the subject was discussed. It was resolved—(a) that further systematic study of equine encephalomyelitis and Kumri and their relationship, causal factors and control is urgently needed;

(b) that arrangement may be made for the collection of all the available information from all investigators engaged on the subject, and whether the results are tentative or otherwise it may be circulated amongst other workers.

REPORT OF THE SUB-COMMITTEE ON LIVESTOCK IMPROVEMENT.

MONDAY, THE 14TH DECEMBER AND TUESDAY, THE 15TH DECEMBER 1936.

MEMBERS PRESENT:

Col. A. OLVER (*Chairman*).
 Mr. E. J. BRUEN.
 Mr. N. CHATTERJI.
 Rni Bahadur Dadu DWARKANATHSINGH.
 Mr. C. J. FERNANDES.
 Mr. K. P. R. KARTHA.
 Mr. R. W. LITTLEWOOD.
 Mr. I. MALIK.
 Lieut. A. A. MONTEIRO.
 Mr. R. N. NAIK.
 Mr. P. N. NANDA.
 Mr. K. R. NARAYANA IYER.
 PATTAGAR OF PALAYAKOTTAI.
 Mr. C. H. PARR.
 Mr. T. F. QUIRKE.
 Mr. N. SHARMA.
 Mr. WYNN-SAYER.
 Mr. HARIDAS MORARJI VETJI.

Subject No. 14.—To survey the present position in regard to sheep breeding in India and to make suggestions for its development. (Appendix XII.)

It was considered that a great deal of systematic breeding of different indigenous breeds of Indian sheep was required. After discussion it was agreed.

(1) That, in order to develop sheep breeding on a broad scale, the first thing to be done was to induce non-migratory flock owners to take up the breeding of pure bred indigenous sheep.

(2) Each province should, as far as possible, maintain at a central farm, nucleus flocks of all indigenous breeds which are of economic importance in the province.

(3) For extensive work in the districts it was recommended that demonstration flocks of these breeds consisting of 50 ewes and two rams each, might be issued to selected breeders for breeding pure bred stock under suitably controlled conditions.

(4) The financing of such demonstration flocks should be a legitimate object on which to expend village uplift funds.

(5) A system of subsidy was described under which Rs. 3 a month is paid to the breeders who maintain flocks of 50 sheep and one ram under departmental supervision. This system has been in operation in certain districts of the Punjab for two years and results are very encouraging.

Subject No. 15.—To discuss the desirability of introducing cattle dips on a wide scale in India and the type of dip best adapted for use in this country. (Appendix XIII.)

It was considered that systematic dipping of village cattle was likely to be of great importance in certain areas but, in view of the insufficiency of the data available, it was decided that before making any general recommendation on the subject, it was necessary to await the results of the experiments which were being carried on in the Bombay Presidency under a grant made by the Imperial Council of Agricultural Research. In the meantime it was decided that

(1) All information should be obtained from the Military Dairy Farms regarding the use of dips and the results achieved.

(2) The Concrete Associations of India should be asked to furnish information as to the design and cost of dips and as to what facilities the association would be prepared to give if the provision of dips were undertaken in this country on an extensive scale.

(3) Demonstration dips should, wherever possible, be established at Government cattle breeding farms and use for propaganda purposes.

(4) The recommendations made by the author of the note should be considered when more information was available.

Subject No. 16.—To discuss the different methods of branding and tattooing animals for purposes of identification. (Appendix XIV.)

It appeared from the discussion that if properly done, tattooing was the best method of marking though it is admittedly slow and necessitates handling of animals to establish their identity.

The sub-committee recommends that approved cattle should be branded on the cheek with a specified mark to indicate that they are selected improved stock. Further marking for individual identification should be done by tattooing in the ear. If branding is to be carried out on the hide, it should be done on the neck.

Subject No. 12.—To discuss the provisions of the Bombay Livestock Improvement Act and consider the practicability of introducing them in other parts in India. (Appendix X.)

The matter was discussed at length and after hearing Mr. Bruen's experience of the application of the Bombay Act it was agreed that an enabling Act for compulsory castration would be an advantage in most provinces and States but that it would be very necessary to exercise tact in its application. It could only be applied where the great majority of breeders were agreeable and where arrangements could be made to supply an adequate number of suitable bulls to serve the cows in the area concerned.

Subject No. 13.—To discuss co-ordination of cattle improvement measures to give full effect of His Excellency the Viceroy's scheme. (Appendix XI.)

The response which had been made to the Viceroy's appeal was discussed at great length and the views of the various provinces were obtained as to any difficulty they had experienced in dealing with the matter.

As regards Madras Presidency it was understood that a considerable number of presentations had been made and that it was proposed to place the money in a central fund which would be dealt with by the Provincial Economic Council and distributed to District Boards to be utilised for the purchase and maintenance of bulls.

In Bombay Presidency Mr. Bruen stated that he had started a cattle-breeding society a number of years ago but that he had found it necessary to discontinue the work. In answer to the Viceroy's appeal a large amount of money had been subscribed but there was considerable difficulty in utilising it satisfactorily because in a large proportion of cases the donors wished their subscription to be utilised in their own districts. He would prefer that the whole of the money received should be paid into a central fund and placed at the disposal of the Livestock Officer, to be used for cattle improvement, particularly in the areas from which money had been subscribed. Otherwise it would be very difficult to ensure continuity of the work and it was necessary that bulls should be examined and approved by the Provincial Livestock staff before they were accepted.

Mr. Quirke stated that in the Punjab all the money donated is handed over to the District Board for cattle improvement to supplement the cattle improvement work already being done by them. One of the reasons why it was necessary that the money should be utilised locally was because the price of stud bulls of different breeds varied greatly.

In the course of the discussion it appeared that actual registration of services was not carried out for all approved bulls in service in the Punjab but is confined to certain selected tracts or areas of concentration. It was proposed in the Punjab to approach wealthy zamindars individually with a view to inducing them to purchase and maintain bulls.

In the United Provinces, there was a Provincial Board which dealt with cattle breeding policy in the Province and all donated funds were allotted to District Cattle Improvement Committees. Bulls issued from the Provincial Breeding Farms were issued mainly to certain concentrated breeding areas but the majority of bulls in service in the Province were purchased as young stock from the Punjab and issued to breeders at Rs. 22 each. They remained the property of Government and could be withdrawn if not maintained in satisfactory condition. No system of registration was in force.

In Bihar a Provincial Cattle Breeding Association had been formed of which anyone could become a member by paying Re. 1 a year. Landlords and others had been approached to make gifts of Rs. 300 for the purchase of bulls. District Associations would carry on breeding in intensive breeding tracts.

A number had already been formed and a considerable amount of money had been subscribed. In the non-intensive breeding areas, it was proposed to issue bulls to veterinary hospitals first and to extend the work as more became available. At present there were only about 50 bulls available and they had to pay from Rs. 200 to Rs. 300 per bull varying according to breed.

In the Central Provinces funds were collected by Deputy Commissioners and dealt with by the Revenue authorities. Cattle-breeding was controlled by the Agricultural Department and bulls were issued to controlled breeding areas at the rate of one bull per 50 cows. They were

maintained by the villagers under the supervision of Agricultural Assistants and Kamdars. No breeding records are maintained. It was proposed to have a central fund with the Governor as the President and District Funds to deal with funds subscribed in answer to the Viceroy's appeal.

In Orissa a cattle-breeding society had been formed under the presidency of the Governor. Anyone giving Rs. 1,500 would become a Vice-President. Those who subscribe Rs. 100 would become life-members and ordinary members would pay Rs. 5 per annum. It is proposed that this society shall purchase and maintain bulls and control breeding policy in the Province. District Boards would also provide funds for cattle-improvement.

In dealing with the 11 points on which information is desired the following was agreed to:—

- (1) In certain provinces cattle-breeding associations have been formed with a view to implementing the Viceroy's appeal but it is considered that where satisfactory breeding control already exists, these are not necessary.
- (2) That wherever bulls are provided by Provincial or District Cattle Breeding Associations it is essential that provision be made from the same source for their maintenance. Otherwise it may not be possible to accept them.
- (3) In order to carry on continuous improvement it is necessary that the services and accredited progeny of approved bulls shall be recorded as accurately as possible. For this purpose it is necessary to employ extra breeding staff at the rate of 1 Inspector per 50 bulls. It is not however considered feasible to carry on milk recording without special staff.
- (4) That it was not possible at present to carry out strict registration of pedigree stock under village conditions of breeding.
- (5) Where the cattle of an area are sufficiently pure the recording of approved stock in official herd-books should be taken up provincially. Such recording would be quite distinct from the official registration of pedigree stock of 7 breeds which is now being taken up by the Imperial Council of Agricultural Research.
- (6) Legislation for the compulsory castration of inferior males has already been dealt with under subject No. 12.
- (7) That in order to effect cattle improvement on a broad scale it is necessary to greatly extend controlled breeding in areas where definite types exist and that subsequently, as large numbers as possible of selected bulls from these areas should be employed in areas where at present there is no definite type.
- (8) It was felt that a great deal of good could be done if the herds maintained in jails, mental hospitals, etc., at Government expense, and at Pinjrapoles were more extensively utilised for the breeding of pedigree stock and that at such institutions strict milk recording should be feasible. It was also suggested that inducement might be given to Military Dairy.

Farms to rear the best of their young male stock, of indigenous breeds and to suit their breeding policy as far as practicable to the accepted policy of the country, *viz.*, the improvement of indigenous breeds. It was also suggested that small herds of pure-bred indigenous dairy cattle should be maintained at Government Seed and Demonstration Farms.

- (9) It was considered that for the present free service should, as a rule, be given, but that in certain provinces the system of charging fees should be developed.
- (10) In all provinces vaccination against Rinderpest is now being carried out as a routine measure free of cost.
- (11) This has already been dealt with under item No. (5) above.

Subject No. 17.—To consider the possibilities of hormone therapy in the treatment of irregularities amongst breeding stock in India. [Appendices XV (a) and XV (b).]

From the discussion it was evident that hormone therapy was considered to have great possibilities in India but that a great deal of scientific research with Indian livestock would be necessary before any recommendation could be made.

Work of this nature would obviously form an important part of the research programme of a Genetics Institute, when established.

Subject No. 18.—To discuss the practicability of adopting artificial insemination in India. (Appendix XVI.)

It appeared that a limited amount of artificial insemination had been carried out in India, particularly with horses, but the Committee felt that there were great possibilities for extension. It was agreed that when the proposed Genetics Institute was established this would be another line of work which should be taken up immediately.

REPORT OF THE SUB-COMMITTEE ON ANIMAL INDUSTRY.

MONDAY, THE 14TH DECEMBER 1936 AND TUESDAY, THE 15TH DECEMBER 1936.

MEMBERS PRESENT:

1. Mr. C. B. SAMUEL (*Chairman*).
2. Mr. T. AUSTIN.
3. Capt. B. R. BINGLEY.
4. Mr. E. J. BRUEN.
5. R. B. B. M. DAS.
6. Mr. K. KAILASAM AYYAR (*Rapporteur*).
7. Mr. W. S. READ.
8. Dr. B. SUNDARA RAJ.

Subject No. 19.—Marketing of Livestock and livestock products. (To consider the conclusions of the Livestock Reports of the Agricultural Marketing Adviser). (Appendix XVII.)

It is desirable to classify the type of working animals into light, medium and heavy, such as by measurements, age, etc., with reference to the various breeds. Information about the rates of fee charged for each animal allowed into the grounds of cattle fairs and markets should be included in the Annual Calendar of fairs, etc. The licensing of brokers should be considered for recognised cattle fairs and markets.

Subject No. 20.—Selective indigenous breeding versus cross-breeding with imported poultry for commercial egg production. (Appendix XVIII.)

It would appear that cross-bred birds are preferable for egg production. The data furnished are incomplete. The Committee feels, however, that comparative experiments under controlled conditions should be carried out.

Subject No. 21.—Grading of hides and skins and the development of the Hides and Skins Industry in India. [Appendices XIX (a) and XIX (b).]

(1) That the development of hides and skins trade is closely bound with the improvement of the nutrition and healthy treatment of animals, which aspect must be kept in mind in taking up all animal husbandry problems.

(2) That in those areas affected by warble flies, the Provincial Governments concerned should consider and take immediate action with regard to warble fly infestation or implement schemes for the elimination of the warble fly.

(3) That a step in the right direction to improve the defects in hides would be to have a standardized grading system for the internal trade in hides and skins, which must be finally decided after a conference of snippers, tanners, hides and skins dealers and others interested in the Trade and thereafter to initiate more hides and skins grading stations at important trade centres.

(4) That investigation regarding control of Ticks on Livestock be taken up at an early date.

(5) The defect of branding may to some extent be eliminated if chemical marking be adopted, with which the Punjab Government have already made experiments at the Hissar Farm. The farm may be requested to send a chemically marked hide to the Bengal Tanning Institute to ascertain if such marking affected the pelt.

Subject No. 22.—Salvage of dry cows from city dairying. (Appendix XX)..

After a preliminary discussion on the main points of salvage, it was felt that the matter was such as could not be decided early and the Committee therefore recommends that this subject be investigated thoroughly by a special small committee or even a special officer, owing to the paucity of data available at present as the problem is so very different from city to city. The data obtained may be discussed at the next meeting.

This Committee is also of opinion that the elimination of cows from urban areas is definitely a step in the right direction in solving the problem of salvage. It would also directly lead to a better milk supply in urban areas.

Subject No. 23.—To discuss the development of the Wool and Hair Industries in India. (Appendix XXI).

The Committee feels that a simple system of grading wool should be devised for the proper development of the wool industry. It is also suggested that at sheep shearing centres facilities for washing sheep may be provided.

In addition to the aforesaid subjects the Sub-Committee took up the problem of freight for transporting cattle, etc., by rail in which connection the following points were noted:—

(1) The Madras Co-operative Milk Supply Society has an idea of sending the dry cows outside Madras by rail and would like special facilities for that purpose.

(2) With reference to the type of waggons for conveyance of wet hides—

(a) it is desirable to provide either wooden waggons or iron ones which are made heat proof;

(b) freight for wet salted hides and skins should be less than those for dry hides and skins;

(c) freights for smaller consignments which may not come up to a waggon load should be brought down to the waggon load rates.

(3) The provision of heat proof waggon applies to cattle as well.

(4) Facilities for loading cattle by the provision of ramps properly constructed with pens.

(5) The Agricultural Department should attempt to get a general reduction of freight in respect of cattle and cattle products.

(6) Mr. Bruen.—Facilities regarding supply of waggons, arrangements for watering animals en route, etc., are far important than the reduction of railway freight.

REPORT OF THE SUB-COMMITTEE ON ANIMAL NUTRITION.

MONDAY, THE 14TH DECEMBER 1936 AND TUESDAY, THE 15TH DECEMBER 1936.

MEMBERS PRESENT:

Dr. P. E. LANDER (*Chairman*).

Rao Bahadur D. ANANDA RAO.

Dr W. BURNS.

Dr. T. J. MIRCHANDANI.

Mr. H. B. SHAHI.

Mr. A. VISWANATHA IYER.

Rao Bahadur M. VAIDYANATHAN.

Mr. J. A. WHITEHEAD.

Dr. N. C. WRIGHT.

Dr. K. C. SEN (*Rapporteur*).

Subject No. 24.—Fodder and Fodder Resources in India. (Appendix XXII).

The Committee discussed this subject from two broad standpoints, *viz.*, cultivated fodders and natural pastures. They considered and endorsed the discussion held in the full meeting on the 14th morning on the economic and scientific control of forest and other natural grazing areas from an economic point of view and emphasised that this is of prime importance and an integral part of the fodder problem of India.

In regard to cultivated fodders, the Committee feel that accurate statistics of the acreage under various fodder crops should be obtained from all provinces and that the following questionnaire may be issued with the specific object of obtaining, as far as possible, a statement showing the available fodder crops for the stock of each province preferably district by district. (Some indication of the deficiency of fodder resources should thus be brought to light and it might be possible then to take steps to increase the area under fodder crops to remedy this deficiency).

Questionnaire—

- (1) Can you produce a tabulated statement showing the areas of all the fodder crops grown in your province? Can you indicate those which are grown as simple fodders and those which are harvested for grain and the roughage used as fodder?
- (2) From this table can you prepare a statement showing the total weight in tons of each of the respective fodders grown?
- (3) Can you indicate the number of livestock including sheep and goats in your province?
- (4) Can you give figures showing the amount of culturable waste other than fallow—both Government and private—and state how much of the area can be used for grazing?
- (5) Can you produce a topographical map showing the sites of the areas specified?
- (6) Can you indicate, as far as possible, the general type of agriculture and whether cattle-breeding or milk production is a speciality of the respective districts dealt with?
- (7) Can you supply accurate analytical data of the fodders grown in your province?

Subject No. 25.—To discuss the possibilities and results of utilising surplus molasses as cattle feed. (Appendix XXIII).

The Committee considered the existing information bearing on this problem. This indicates roughly that one or two pounds of molasses can conveniently be fed to cattle as a substitute for a certain part of roughage (or concentrate of low protein content) during the winter months. The Committee recognise that more information from carefully controlled experiments is required, before the true place of molasses as a feeding stuff can be stated. Dr. Lander has promised to carry out further work on this problem on dry heifers, and, if possible, on milch cows. He is also making arrangements with the Imperial Council of Agricultural Research to investigate the feeding values of the molasses cakes which are being produced at Cawnpore. Dr. Mirchandani also expressed his willingness to carry out similar work in Bihar. The results of these works will be presented in due course.

Subject No. 26.—To discuss the best methods for co-ordinating the work of the Central Animal Nutrition Section, Izatnagar, and similar institutions in the Provinces and to suggest ways by which the Central Institute could best function as the Central Bureau for dissemination of information. (Appendix XXIV).

The Committee carefully considered the matter and the note drawn up by Dr. Sen, and came to the conclusion that it is desirable to postpone any decision on this matter for the present. They believe that the Agricultural Experts now studying the research work under the control of the Imperial Council of Agricultural Research will have something to say on the general question of co-ordination. The subject can therefore more usefully be discussed after their report is received and the Animal Nutrition Institute is ready for work.

Subject No. 27.—To discuss the control of Equine Abortion in Indian studs, with special reference to the role of minerals in this disease. (Appendix XXV).

The Committee discussed this problem and recognise that no specific research work has yet been carried out in India on the problem of equine abortion in relation to malnutrition. They had before them cases of some empirical observations which have been made at some stud farms where mineral supplements in rations have given evidence of diminishing considerably the incidence of the disease. The Committee recognise that mineral deficiency may be only one of a number of causes which open out the path to the specific organism involved or may cause abortion even in the absence of the specific organism. They feel that the first step in the investigation is to collect all information available from private and Government stud farms in India as to the occasions on which the disease has been pronounced, the treatment from the nutritional point of view which has been given and the results which have been seen. This should supply some preliminary data for pursuing this enquiry further on a scientific basis. The Committee recognise that horse-breeding in India being of great importance, one of the functions of a central institute of animal nutrition should be to investigate scientifically this disease wherever and whenever it occurs.

This should resolve itself into something more than perfunctory advice and detailed investigations as the situation may demand should be carried out in co-operation with any local authorities concerned.

Subject No. 28.—To discuss the present position of the work in different parts of India on the effect of mineral feeding in dairy animals, from the standpoint of production and prevention of diseases. (Appendix XXVI).

The Committee discussed the work which has already been attempted in India in connection with the role of added minerals to rations of dairy animals in relation to disease. The Committee recognise that work has so far been carried out on rather empirical lines but, nevertheless, definite results have been obtained showing that when minerals are added certain diseases, such as Johne's disease, can be ameliorated or prevented. The Committee reviewed in particular the work carried out at Muktesar in which groups of animals are fed with complete minerals mixture added to the rations and compared with control group which received no added minerals. This is in particular reference to the incidence of Johne's disease and the results show an approximately 95 per cent. reduction in the incidence of the disease amongst the animals receiving added minerals as against those who receive none. Some work carried out in Bihar has also shown that added minerals are instrumental in improving the condition of animals which have shown a disposition to lick earth and which have also shown placental trouble. The Committee considered the lines to be followed for future work in India on this problem and feel that the Central Institute of Animal Nutrition ought, to begin with, to carry out long period investigation on dairy stock from birth up to the 4th lactation in order to ascertain what the mineral requirements of these animals in conditions of health are. These requirements obviously must be correlated with the analytical data of the rations fed. *Pari passu* with these investigations, it should give assistance to the provinces and in the light of its own experimental information should investigate cases which come to light indicating that mineral deficiencies are responsible for malnutrition and disease in dairy stock.

Subject No. 37.—Sets of formulae to be employed in connection with experiments on Animal Husbandry and control of diseases. (Appendix XXXIII).

The Committee considered the note of Rao Bahadur M. Vaidyanathan but feel that a more immediate need than sets of formulae to be employed in Animal Husbandry investigation, is the production of a note or notes dealing with elementary aspects of statistical considerations. This should set forth in simple language the necessity for statistical control, and illustrate by definite examples on some chosen set of experimental data how these considerations may be employed both for the laying out of the investigation, and drawing conclusions from the results. Rao Bahadur Vaidyanathan has agreed at an early date, to produce such a note. The Committee, in making this recommendation, have borne in mind that most of the investigators engaged in animal husbandry research have received a training more biological than mathematical and require to be introduced more fully to the part which statistical control can play in helping them with their work. The Committee see no objection, however, to any research work in animal husbandry submitting the layout of his researches to the Statistician of the Imperial Council of Agricultural Research for help and advice as to how far the results likely to be obtained from any given plan might be amenable to statistical interpretation.

REPORT OF THE SUB-COMMITTEE ON DAIRYING.

14TH DECEMBER 1936."

MEMBERS PRESENT:

Mr. ZAL R. KOTHAVALLA (*Chairman*).

Mr. B. K. BADAMI.

Mr. WYNNE SAYER.

Mr. E. J. BRUEN.

Mr. J. V. TAKLE.

Mr. P. T. SAUNDERS.

Mr. S. K. ROY.

Subject No. 29.—To consider whether the time is ripe for the formation of breed and milk-recording societies in India as an aid to developing high milk-yielding strains of the more important Indian breeds of cattle and enhancing the prices of recorded pedigree stock. (Appendix XXVII).

The Chairman in opening the proceedings indicated that the agenda was small but stated that all the three subjects were of great importance or the future development of the dairy industry of the country.

In referring to item No. 29, the first on the agenda of the dairy committee, he stated that he had submitted a note on the subject, which was asked for by the Imperial Council of Agricultural Research. The note broadly indicated the difficulties experienced at present in the buying of reliable milch stock in the absence of any recording system and the consequent handicap under which the dairy trade had to be developed. It gave an idea of what was being done in other countries quoting the example of Denmark and it also indicated as to how such breeding and recording associations could be established in India and the organisation necessary for such a purpose and the relationship between the central and provincial workers.

On the discussion of the subject the committee felt that the starting of breeding and milk recording societies was a necessary prelude to the starting of herd books which has been decided upon by the Imperial Council of Agricultural Research for some of the more important milch breeds of the country. The necessary material for entry into such herd books could only be obtained through such breeding and milk recording societies. The committee therefore strongly felt that the time was ripe for the formation of breed and milk recording societies. Mr. Sayer raised the point of fixing the period of lactation in connection with recording and felt that 10 months, or 304 days would be a proper period for purposes of comparing the performance of dairy cows. Mr. Bruen thought that a lactation of 270 days a more reasonable period when looked at from the point of view of economic production of milk and providing rest to the cow after calving. Mr. Takle suggested that the period should be fixed at 300 days, as that would provide enough rest to the cow and at the same time simplify calculations by adopting a round figure. After further discussion it was agreed that 300 days would be a suitable lactation period for adopting as a standard for purposes of calculating the performance of a cow.

On the question of obtaining enhanced prices for pedigree stock, it was pointed out by Mr. Bruen that some of the farms in this country both Government and private had been producing pedigree stocks for years, but the public were rather slow in appreciating the value of improved stock only because they were ignorant of the advantages of such stock over the non-pedigree stock. For this he thought they required to be enlightened. Mr. Sayer said that they experienced a similar difficulty in the beginning with his pedigree Sahiwal herd, but now that the animals issued for his herd had proved their merit there was an ever increasing demand for the bulls and the prices had also increased considerably. He, however, agreed that propaganda for the use of pedigree stock was necessary. The Committee on further discussion of the subject, felt that there was an urgent need for carrying out propaganda for educating the public in the advantages of using pedigree stock; how the non-pedigree stock was costly to maintain in the long run; how rapid improvement could be brought about in the local stock by the use of pedigree bulls; the breeds which would be most suitable for such purposes and the places or farms from where pedigree stock could be obtained in this country. It was felt that this kind of propaganda can best be done through a central agency and the best form of doing it would be by the publication of the list of farms producing pedigree stock and the distribution of leaflets, posters, etc., indicating the merits of pedigree stock. The Committee also felt that in the establishment of breed and milk recording societies there should be fullest co-operation between the central and provincial organisation and also co-operation from the public.

After a full discussion of the subject the Committee made the following recommendations:—

- (1) The Committee is of the opinion that the time is ripe for the formation of breed and milk recording societies as an aid to developing the dairy industry of the country.
- (2) The Committee is also of the opinion that there is great need for educating the public on the advantages of using pedigree stock, and that this kind of propaganda can best be carried out through a central agency for which necessary facilities should be provided.

Subject No. 30.—To discuss the correlation of Central Pedigree Herd Books with methods of provincial registration.

This was then considered by the Committee. Although a note had been asked for by the Imperial Council of Agricultural Research from one of the members of the Animal Husbandry Wing Meeting, it had not been submitted. This made the discussion of the subject by the Committee a bit difficult. After some opening remarks the Chairman asked Mr. Bruen to relate his experience, it being felt by the members that the systematic work of registration of cattle was most advanced in the Bombay Presidency. Mr. Bruen very briefly explained the methods he had adopted in registering the bulls, cows and the young stock in the villages and which were bred through his pedigree bulls. All such stock owners were issued registration certificates and at the time of sale the animals possessing the certificate fetched more than three hundred per cent more value than the unregistered stock. This made the stock breeders very

keen on getting their stock registered in the villages. After further discussion of the subject the Committee felt that for the registration in Central Pedigree Herd Books only such milch breeds which are of all-India importance should be taken into consideration, leaving the breeds of local importance to Provincial Governments for registration. The central organisation should frame rules and methods of registration which could be uniformly applied throughout the country for breeds of all-India importance. The application for registration should go through provincial organisation with their recommendations and a periodic check should be made by the central organisation of such recommendations. The question of charging fees for registration was also considered by the Committee. It was felt that a reasonable fee should be charged for registration of stock which would help in partly covering the expense which would be incurred in making the necessary organisation, but in order to provide an incentive to stock-breeders for getting their stock registered, no fee should be charged for a certain period in the beginning.

After full consideration of the question the Committee recommended that—

- (1) The Central Pedigree Herd Books should interest themselves in milch breeds of cattle which are of all-India importance and should lay down forms, method, rules; etc., for registration of such breeds to be followed by the provinces.
- (2) The application for registration of animals of such breeds should be made to Provincial organisation in the first instance who, after verification, should pass it on to the Central organisation with necessary recommendations.
- (3) In order to accelerate the move for registration, for the first 1½ years of the starting of the Herd Book no charge should be made. Thereafter a fee of about Rs. 2 should be levied on each animal registered.

Subject No. 31.—To discuss the importance of buffaloes to the dairy industry and their place in the general agriculture of the country.

The Chairman in opening the discussion drew the attention of the Committee to the note he had submitted on the subject for the First Animal Husbandry Wing Meeting and read out the extracts from it. The Committee then considered the subject in all its aspects. It was felt that the buffalo had established its reputation as a dairy animal in this country, although it had not received the same amount of attention in its improvement as the cow in the past. It gave higher and better quality of milk than the cow under rural conditions and some of the products made from its milk were preferred by the Indian consumer. For its ability to convert coarser type of fodder into milk, the ease with which it can be disposed of when cased and the better butcher's value that it fetches than the cow, all tend to make the buffalo an economic factor of great importance in rural dairying. It was also observed that in the typical milk producing areas of the country where the bulk of milk was obtained from buffaloes some of the finest breeds of cows existed. On the other hand there were tracts of the country where in spite of there being some of the finest breeds of cows existing, there had been very little of the dairy industry because of the absence of buffaloes which would indicate that one did not necessarily thrive at the cost of the other. Mr. Badami pointed out that in parts of his State towards Deccan the buffalo made a very useful work animal for certain types of cultivation.

The Committee after discussing the subject fully recommended that—

- (1) The buffalo as a dairy animal has established itself throughout India and for the development of the dairy industry of the country it is indispensable.
- (2) Adequate attention has not so far been given to the development of the various breeds of buffaloes and that the time has now come for making a serious effort at developing the important breeds.
- (3) The male stock is of great utility in certain types of cultivation, as such the buffalo has an important place in the general agriculture of the country.

PROCEEDINGS OF THE SECOND MEETING OF THE ANIMAL
HUSBANDRY WING OF THE BOARD OF AGRICULTURE
AND ANIMAL HUSBANDRY, INDIA, HELD AT MADRAS ON
WEDNESDAY, THE 16TH DECEMBER 1936.

The following were present—

1. Sir BRYCE BURT (*Chairman*).
2. Mr. S. D. ACHAR.
3. Capt. A. C. AGGARWALA.
4. Rao Bahadur D. ANANDA RAO GARU.
5. Mr. B. K. BADAMI.
6. Mr. BALWANT SINGH.
7. Capt. B. R. BINGLEY.
8. Mr. E. J. BRUEN.
9. Dr. W. BURNS.
10. Mr. N. CHATTERJEE.
11. Mr. CHENGRI.
12. Rai Bahadur B. M. DAS.
13. Capt. S. C. A. DATTA (*Tech. Secretary*).
14. Rai Bahadur DADU DWARKANATH SINGH.
15. Mr. L. S. FARBROTHER.
16. Mr. C. J. FERNANDEZ.
17. Mr. J. S. GAREWAL.
18. Rai Sahib S. C. GHOSE.
19. Mr. RIAZ-UL-HASAN.
20. Mr. T. J. HURLEY.
21. Mr. NIZAM-UD-DIN HYDER.
22. Mr. J. H. G. JERROM.
23. Mr. K. KALLASAM IYER.
24. Mr. K. P. R. KARTHA.
25. Mr. K. K. IYENGAR.
26. Mr. P. J. KERR.
27. Mr. Z. R. KOTHAVALLA.
28. Dr. P. E. LANDER.
29. Mr. R. W. LITTLEWOOD.
30. Mr. E. O. LONGLEY.
31. Mr. M. R. MAHAJAN.
32. Mr. M. I. MALIK.
33. Dr. T. J. MIRCHANDANI.
34. Mr. D. T. MITCHELL.
35. Mr. A. K. MITRA.
36. Mr. N. P. MOHAN.
37. Lieut. A. A. MONTERIO.
38. Mr. T. MURARI.

39. Mr. R. N. NAIK.
40. Dr. H. K. MEHRA.
41. Mr. P. N. NANDA (*Tech. Secretary*).
42. Mr. K. R. NARAYANA IYER.
43. Col. A. OLVER.
44. Mr. C. H. PARR.
45. Mr. R. D. PAUL.
46. Mr. T. F. QUIRKE.
47. Mr. RAMA RAO.
48. Mr. P. V. RAMAYYA.
49. Mr. W. S. READ.
50. Mr. S. K. ROY.
51. Mr. C. B. SAMUEL.
52. Mr. P. T. SAUNDERS.
53. Mr. WYNNE SAYER.
54. Dr. K. C. SEN.
55. Mr. S. K. SEN.
56. Mr. H. B. SHAHI.
57. Mr. K. SHARMA.
58. Mr. J. F. SHIRLAW.
59. Mr. E. A. SMYTHIES.
60. Mr. A. SUBRAMANIA IYER.
61. Dr. B. SUNDARA RAJ.
62. Mr. J. V. TAKLE.
63. Mr. P. K. RAMAKRISHNAN TAMPI.
64. Mr. W. TAYLOR.
65. Rao Bahadur M. VAIDYANATHAN.
66. Mr. HARIDAS MORARJI VETJEE.
67. Mr. G. R. VISWANATHAN.
68. Mr. F. WARE.
69. Mr. T. A. WHITEHEAD.
70. Dr. N. C. WRIGHT.

N. C. MEHTA, I.C.S., *Secretary*.

The meeting lasted from 10 A.M. to 6-45 P.M. with an interval for lunch from 1-15 P.M. to 2-45 P.M.

REPORT OF THE VETERINARY EDUCATION SUB-COMMITTEE.

2. To consider a scheme implementing the recommendations of the Royal Commission on Agriculture to make provision for the training of Indians in India up to the highest standard of veterinary education. (Subject No. 1 of the Agenda). (Appendix I).

Mr. Ware in introducing the report of the Sub-Committee on Veterinary Education mentioned that members had already had an opportunity of reading Col. Olver's note on the subject as well as the proceedings of

the Sub-Committee which had dealt with it. It was therefore not necessary for him to say more than a few words. The Committee had accepted the proposals contained in Col. Olver's note and had only suggested a few minor alterations. The history of Veterinary Education in India was familiar to most of them. Proposals for improvement had repeatedly been considered but the matter was still hanging fire. If approval were given to Col. Olver's scheme, the present would be a particularly favourable opportunity for providing improved facilities for veterinary education in this country. He drew special attention to the three items on page 2 of the report and on page 3. In the scheme it was suggested that recruitment of students from provincial colleges should be on a 50-50 basis but the Committee felt that Provincial Colleges would know better how they stood if they could rely on obtaining one seat at the all-India College per annum. Mr. Kerr supported the recommendation of the Sub-Committee.

Mr. Garewal asked if it was worth while to open a new College in India.

Col. Olver stated that they needed a central college in India which could teach up to the highest standard. If facilities were provided for training Indian students up to the M. R. C. V. S. standard in India, the beneficial effect on veterinary education throughout the country would be greater than if they had to go abroad for training. But in order to implement this scheme it would be necessary to have a number of fully trained and highly qualified veterinary surgeons from England and that the course of training and the examinations should be kept up to the highest standard.

Mr. Garewal pointed out that there were 5 veterinary colleges in India and asked if one of these could not be selected and the best qualified candidates from this college sent to England for post graduate training.

The Chairman said that India ought not to be dependent for veterinary education on foreign colleges. All were in favour of sending graduates abroad for higher specialised training but it was better for a country like India not to be dependent on a foreign country for general professional training.

Mr. Garewal observed that there was no guarantee at present that graduates of such a college would find employment after they had qualified. He stated that a number of Indians with M. R. C. V. S. qualifications still remained unemployed in this country.

The Chairman said that he understood that there were not many M. R. C. V. S. still unemployed.

Mr. Garewal said that there were about 40 men undergoing veterinary training in England. He wanted to bring this to the notice of the members and enquired whether in these circumstances it would be worth while opening a central veterinary college in India.

Mr. Kerr reviewed the position as to the prospect of employment for M. R. C. V. S. in India and pointed out that it would take at least two years to establish this college and in the meantime the unemployed men would be absorbed.

The recommendations of the Sub-Committee were accepted.

REPORT OF THE ANIMAL HEALTH SUB-COMMITTEE.

3. To review the position in regard to the value of the different methods of conferring protection against Rinderpest and to suggest practicable means of extending such work in connection with measures for the improvement of cattle. (Subject No. 5 of the Agenda.)

Mr. Kerr, in introducing the report, said that the object of the discussion was to obtain the consensus of opinion as to the best method of employing goat virus whether as a prophylactic or purely as an outbreak stopping method.

He went on to say that the discussion showed that time was not ripe for making a definite pronouncement. In some provinces danger was anticipated in stamping out the disease since the emergence of a race of cattle more susceptible to rinderpest was possible, leading to a risk of heavy mortality in the event of subsequent introduction of fresh infection. Mr. Mitchell was not in favour of using vaccine as an out-break stopper only. He mentioned the analogy of small-pox immunisation in human beings to illustrate his point that protection of the healthy should be extended as widely as possible.

Mr. Garewal considered that now that a successful vaccine had been evolved, after many years of experimentation, the widest possible use should be made of it in anti-rinderpest work. Mr. Ware suggested that only the best cattle should be vaccinated and that inferior animals should be allowed to take their chance seeing that there was a great surplus of cattle in the country and a scarcity of fodder. He suggested that by charging a small fee for vaccination owners would be forced to decide which of their cattle were worth paying for and which might be left unvaccinated. Mr. Shirlaw did not consider that at any near date wide spread immunisation and wholesale protection of the total cattle population would be possible. Mr. Garewal doubted whether it would be proper to allow inferior cattle, which might represent the only resources of poor peasants, to die; particularly when an efficient protective agency had at last been obtained. Mr. Riazul Hassan considered that with the means of protection now available no cattle should be allowed to die of Rinderpest.

Mr. Parr saw great danger in Mr. Ware's policy and questioned whether so called scrub cattle were always surplus. Because of the economic factors involved in such a policy he urged extreme caution.

Mr. Shirlaw added that this policy also had a moral bearing in that the question of medical ethics was undoubtedly involved. It would not be moral on our part to allow cattle to die while we have a very effective means of saving them. Mr. Kerr stated that certainly in Bengal a large proportion of the cattle were surplus to requirements and not worth preserving. Dr. Wright here made a constructive suggestion that cattle improvement and rinderpest immunisation might be made to go hand in hand by favouring good cattle in considering immunisation programmes.

While endorsing Dr. Wright's suggestions that Rinderpest vaccination and cattle improvement should be made to go hand in hand by systematic protection of improved stock, Colonel Olver did not think that Mr. Ware's suggestion that inferior cattle should be allowed to die could be accepted by the meeting. As it became more generally known that cattle could safely and cheaply be protected against death from Rinderpest it might perhaps be expected that stock owners would realise that it was no longer

necessary to maintain surplus cattle as an insurance against periodical outbreaks of Rinderpest. They might even be willing to pay a reasonable fee for the vaccination of their good cattle, as was now the case in areas where high grade cattle were produced. The Chairman then put Dr. Wright's proposal regarding the carrying on of cattle improvement measures and rinderpest immunisation hand in hand and the desirability of this was accepted. The conclusions of the Committee were accepted as follows:—

That before arriving at a conclusion as to whether goat virus should be used for general prophylaxis or for outbreak control only further experience was required.

It was necessary to know whether it was possible in India to establish rinderpest free areas, and if so what would be the effect in such areas should rinderpest be accidentally introduced after a considerable period of immunity.

For the control of Outbreaks it was generally agreed that Goat Virus, and Vaccine were safe, efficient and the most readily applied methods of dealing with rinderpest in Indian cattle. For Buffaloes these methods required more investigation, province by province, district by district and in each breed. At present a control dose of serum given simultaneously with the vaccine would be safer than vaccine alone.

All good cattle and buffaloes, and improved animals should receive prophylactic treatment.

India should be mapped out to show the areas in which the disease was enzootic.

4. To review the control measure now being adopted against Haemorrhagic Septicaemia, particularly with reference to the use of anti-serum and vaccine. (Subject No. 6 of the Agenda.) (Appendix IV.)

After the findings of the Committee had been explained by Mr. Kerr, Mr. Kailasam Iyer drew attention to the last sentence of the report and said that there was a likelihood of a wrong impression being given by it and that in their experience in Madras, serum alone had given excellent results.

Mr. Shirlaw stated that the Muktesar H. S. anti-serum and vaccine were among their most satisfactory and eagerly sought after products. The efficacy of the serum was unquestioned but he felt that one should be careful not to overstate the effect of either serum or vaccine, in dealing with outbreaks which had been in progress for any length of time. Because of the peculiar characteristic of Haemorrhagic Septicaemia outbreaks, they were liable to be on the down grade by the time the deputed officer arrived and it was often difficult to assess the value of the product employed. Asked by Mr. Quirke to explain the procedure adopted in the Punjab, Mr. Nanda explained their system which was to immediately serumize the cattle in the surrounding houses in the event of an outbreak and then to apply vaccination over a wider area. He stated that the procedure had proved very satisfactory. Mr. Saunders emphasised the value of the serum alone method and Mr. Riaz-ul-Hassan explained that he inclined to the view that serum would always be better than vaccine in dealing with diseases due to this class of organism. Mr. Mitchell said he was interested to hear of the successful results which had been obtained with vaccine in India but would stress the necessity for further research

on the production of a more reliable product. It was suggested in the course of the discussion that area vaccines, made with area strains of the organism, might be needed to deal with outbreaks where stock vaccine had not proved efficacious. Sir Bryce Burt suggested the adoption of the report and stated that no resolution was required. The report was accordingly adopted, the need for further research being stressed.

5. To review the position of Bovine Mastitis in India and to suggest the effective methods for its diagnosis and control. (Subject No. 7 of the Agenda.) (Appendix V.)

Captain Datta remarked that the only recommendation made in the report was in the last sentence. Before coming to that he would mention that little information existed in regard to the incidence and importance of Mastitis in India. Excepting a solitary mention by Dr. Edward, no literature was available and though the condition had no doubt existed for a long time, little was known at present as to its extent. It was a condition which should receive most careful attention from field workers and it was for this reason that the subject had been brought before this Board. Mastitis had become a nightmare of the Dairy Industry in all advanced Dairying countries, and now that the development of better dairy cattle was being taken up in India, it was likely that its incidence would increase. So far very few outbreaks had been recorded and only a few sporadic cases had been investigated. During the discussion in the sub-committee the necessity for investigation in the field and in Provincial laboratories and of further study at Muktesar of the causative organism had been brought out. Field diagnosis was simple and could readily be made while cultural and other methods could be carried out in laboratories, but the study of Mastitis might require considerable time. With the improved methods now available progress should however not be difficult.

The Muktesar Institute would have no difficulty in furnishing instructions, incorporating information upon methods of diagnosis, as suggested by the Committee.

The recommendations of the Committee were accepted by the Board.

6. To discuss effective methods of prophylactic inoculation against Black-quarter in India. (Subject No. 8 of the Agenda.) (Appendix VI.)

The report of the Committee was presented by Mr. Kerr. He said that as a result of discussion it transpired that more precise diagnosis of each outbreak than was at present available would be necessary. This should be carried out at provincial laboratories and confirmed by a specialist. Early appointment, at the Imperial Veterinary Research Institute, of an officer with special training in anaerobic work was urgently needed. The mapping of enzootic areas in provinces according to the causal organisms should be carried out. Specific prophylactic inoculation should be adopted as far as possible.

Mr. Shirlaw pointed out that if the report were adopted it would seriously embarrass research at Muktesar. The Institute was at present understaffed. If this recommendation were put into effect an extra worker would be required who was competent to deal with this particular branch of bacteriology.

The Chairman enquired whether what they required would be a technical Assistant.

Mr. Shirlaw said that they would require an extra technical assistant for this disease alone and explained that the recommendations of the sub-committee would involve the provision of an extra Assistant at Muktesar in addition to the specialist officer who was to be employed at Madras.

Mr. Ware said that he was always pleased to receive offers of help but when the already sanctioned posts had been filled he would have no room for more workers at Muktesar. It seemed to him that in making this recommendation, the committee was rather over emphasizing the necessity for confirmation. He thought that it would be possible, if confirmation were required only in a limited number of cases, for the material to be sent to the specialist officer at Madras.

Mr. Shirlaw said that the Diagnosis of Black Leg was much more difficult than Anthrax. Anaerobic organisms were frequently met with and could easily be seen under the microscope but the services of an expert were needed to decide what they were. He went into detail to show that in order to get reliable statistics as to the incidence of the different types of Black Quarter a special highly trained worker at Muktesar would be necessary in addition to the specialist whom it was proposed to employ under the Imperial Council of Agricultural Research Scheme.

To get out of the impasse Mr. Ware suggested that the second sentence of the report should read as follows:—

"This should be carried out at provincial laboratories and confirmed by a specialist."

Colonel Olver said that it was not proposed to carry on special research on this group of organisms at Muktesar in addition to what was to be done at the Madras College and Mr. Ware had already explained that he would have difficulty in accommodating any more staff. They would have to be content with one specialist officer for the present, but it was possible that eventually it would be necessary to have a specialist at Muktesar to deal with the pathogenic anaerobes.

The Chairman remarked that it was evident that confirmation by a specialist was needed and explained that this was being provided for by the appointment of a specialist for such work in Madras.

Arising out of the discussion the report of the sub-committee was amended as follows and accepted by the Board:—

"As a result of discussion it transpired that more precise diagnosis of each outbreak was necessary than was at present available. This should be carried out at provincial laboratories and confirmed by a specialist. The early appointment of an officer with special training in anaerobic work was urgently needed. Mapping of enzootic areas in provinces according to the casual organisms should be carried out. Specific prophylactic inoculation should be adopted as far as possible."

7. The present position of Equine Encephalomyelitis and Kumri in India. (Subject No. 9 of the Agenda.) (Appendix VII.)

The report was presented by Mr. Kerr and amplified by Mr. Shirlaw. Mr. Mitchell pointed out the extremely unsatisfactory state of knowledge in this connection and mentioned the non-existence of Equine Encephalomyelitis in Burma, while Kumri was highly prevalent. He emphasized the need for pooling and circulation of all the available information from workers on the subject. The desirability of this was agreed to, and the report of the committee was adopted.

8. To review the position in regard to the incidence and control of diseases of sheep and goats that are important from the point of view of export of these animals from India. (Subject No. 10 of the Agenda.) [Appendices VIII(a) and VIII(b).]

Establishment of Quarantine Stations at the principal ports of India. (Subject No. 10-A of the Agenda.) [Appendix VIII(c).]

After a brief introduction by Mr. Kerr, the reports of these Committees were adopted.

In regard to the latter subject, it was agreed that the note by Capt. Aggarwala on the establishment of quarantine stations should first be considered by the Committee which dealt with the Contagious Diseases of Animals, (India) Act, and should then be circulated to provinces by the Imperial Council of Agricultural Research with a view to eliciting their opinions.

9. To consider improved methods for combating Anthrax in cattle by vaccine instead of serum. (Subject No. 11 of the Agenda.) (Appendix IX.)

The Sub-Committee report was introduced by Mr. Kerr. Mr. Mitchell, who had had experience both in South Africa and in Burma was asked to speak upon the relative merits of vaccine and serum. He stated that the strain, used in the preparation of vaccine was brought from South Africa some years ago, and the method of preparation in Burma was the same as in that Country, with certain modifications which had been introduced after experience under Burma conditions. His only notable contribution in the matter had been the application of the vaccine to elephants. The results of vaccination had been exceptionally good and the product was cheap while mortality among vaccinated animals had been negligible. He proposed to publish a report on the subject after another year's work. He had used serum and found it very expensive and the results unsatisfactory. The vaccine was therefore the method of choice. In the preparation of Anthrax vaccine there had been many snags. The good results obtained had been due to the work being very carefully controlled. His vaccine had been sent to Siam and Bengal for the last two years, and good reports had been received but he did not want to carry on the supply of vaccine as a business. He invited members to visit Burma to study the technique and offered to help them to study the process of manufacture. He would certainly like to see spore vaccine produced at Muktesar on a satisfactory basis, on the lines adopted in Burma, and he would be glad to give any worker sent to Burma all possible assistance.

Mr. Shirlaw said the preparation of Anthrax spore vaccine had been taken up at Muktesar and during the last decade the question of introducing a more suitable Anthrax vaccine had been engaging their attention. A very large amount of experimental work had been done, but with unsatisfactory results. Their chief difficulties lay in their inability to procure suitable strains and the tendency of strains to vary in virulence. To remove misunderstanding the word "identical" should be substituted for the word "similar" in line seven, page 5 of the report. He assured the Board that the Anthrax vaccine now under preparation at Muktesar would be found to be reliable.

Mr. Riaz-ul-Hassan said that he started work on Anthrax in 1922 and in 1925 because he was himself infected. The Sclavo serum used in his case was two years old but gave relief after four hours. Since then he had studied this disease more carefully. In the Punjab anthrax was very sporadic. Extensive outbreaks seldom occurred and he thought that serum still held the field in the Punjab.

Mr. Balwant Singh stated that owing to climatic conditions Anthrax had this year assumed rather serious proportions in Bengal and that it would always be difficult to completely eradicate the sporadic cases from that province. Outbreaks had been traced to tanneries, slaughter houses, etc., Spore vaccine imported from Burma had been used and was efficacious. The disease had been brought under control within four weeks. Mr. Shirlaw said that the existing system of diagnosis of various epizootic diseases was not satisfactory and that reports as to the efficacy of intervention could not always be relied upon. He suggested that in each district areas of infection should be clearly marked out and that the numbers dealt with should be reported by each province in its annual report.

Many outbreaks of Anthrax were diagnosed which were not Anthrax at all. Efforts should be made to ensure collection of more reliable statistics.

Mr. Saunders said that in Madras they could depend on the diagnosis as suitable staff for this purpose was available.

Mr. Kerr said that his officers were capable of diagnosing correctly and that arrangements were available for carrying out biological investigation.

On being asked by the Chairman whether he would like to press his point Mr. Shirlaw replied that he would. He said that they must have more accurate and reliable information concerning the incidence of Anthrax.

Col. Olver said that one of his objects in securing a veterinary investigation officer in each province and major state had been to make them self-supporting in such matters and it had been anticipated from the inception of that scheme that, particularly in provinces where there was no veterinary college, it would be found necessary to maintain indefinitely a local veterinary investigating staff capable of diagnosing and carrying out reliable investigation of local disease conditions.

Mr. Ware asked that the matter raised by Mr. Shirlaw should be included in the proceedings.

The Chairman then said that the sense of the Board appeared to be that in every province there should be an officer capable of carrying on accurate diagnosis and investigation. Where they did not already exist they should be provided. The report of the Committee was adopted accordingly with the amendment that the word "necessary" was substituted for "requested" in line one of item (1) of the committee's recommendations.

REPORT OF THE LIVESTOCK IMPROVEMENT SUB-COMMITTEE.

10. To survey the present position in regard to sheep breeding in India and to make suggestions for its development. (Subject No. 14 of the Agenda.) (Appendix XII.)

The recommendations of the Sub-Committee were accepted.

11. To discuss the desirability of introducing cattle dips on a wide scale in India and the type of dip best adapted for use in this country. (Subject No. 15 of the Agenda.) (Appendix XIII.)

Col. Olver explained that as a result of discussions in the Sub-Committee a good deal of information had been obtained as to how dipping might be carried out in villages but it was felt that before such dipping could be advocated, it was essential to secure all the information available in the country.

Mr. Kothavala suggested that information might be obtained from the Karnal farm where dipping had been systematically carried out for years past.

Mr. Wynne-Sayer then suggested that steps should be taken to reduce the cost of dipping materials as far as possible. In his opinion Chemical Experts in India should try to evolve a suitable dip to be manufactured in this country.

Mr. S. K. Sen said that derris powder dips, according to recent information, had proved definitely superior to arsenical dips. Regarding the reduction in price of dipping materials he suggested that efforts should be made to have the customs duty waived in the case of all proprietary dips imported into this country. Mr. Bruen drew the attention of the Board to a recent report received from Australia, where a tick resistant breed of sheep had been evolved. The Board accepted the recommendations of the Sub-Committee with the addition of the words "the Government Cattle Breeding Farm, Karnal, etc.", after milk Dairy Farms in item No. 1 of the recommendations.

12. To discuss the different methods of branding and tattooing animals for purposes of identification. (Subject No. 16 of the Agenda.) (Appendix XIV.)

The recommendations of the Committee were accepted by the Board.

13. To discuss the provisions of the Bombay Livestock Improvement Act and consider the practicability of introducing them in other parts in India. (Subject No. 12 of the Agenda.) (Appendix X.)

Mr. Saunders considered that there were certain defects in the Bombay Livestock Improvement Act and pointed out that there was no definition of the term "livestock officer". Further in his opinion regular survey of the numbers of bulls and cows in each district would be necessary before wholesale castration could be enforced.

In answer to an enquiry Mr. Bruen replied that anyone could be appointed a Live Stock Officer for the purpose of the Act and that the Act was being applied in the Bombay Presidency after a complete survey but only in a few selected villages. Mr. Quirke stated that as similar powers already existed in the Punjab, under the District Board Act, there would be no necessity to address that province on this subject.

The report of the Sub-Committee was adopted.

14. To discuss co-ordination of cattle improvement measures to give full effect to His Excellency the Viceroy's Scheme (Subject No. 13 of the Agenda.) (Appendix XI.)

Col. Olver opened the discussion and explained that the object of the note was to collect all the information available in various Provinces for the information of the Viceroy after discussion. The Board accepted the

proposals of the Sub-Committee with the following addition as item 12 of the recommendations:—

“That funds collected in response to His Excellency the Viceroy’s appeal should be placed at the disposal of the Department in charge of the Live-Stock work of the Province and that they should not be merged in other local funds.”

The following amendments were also agreed to *viz.*—

Item 1. The latter part of the sentence after “Viceroy’s appeal” in the 3rd line to be deleted and the following sentence added *viz.* “In other provinces this was undertaken by the Provincial Live-stock Improvement staff.”

Item 4. The word “average” was inserted in the 2nd line between “under” and “village”.

15. To consider the possibilities of hormone therapy in the treatment of irregularities amongst breeding stock in India. (Subject No. 17 of the Agenda.) [Appendices XV(a) and XV(b).]

16. To discuss the practicability of adopting artificial insemination in India. (Subject No. 18 of the Agenda.) (Appendix XVI.)

The recommendations of the Committee were accepted.

REPORT OF THE ANIMAL NUTRITION SUB-COMMITTEE.

17. Fodder and fodder resources in India. (Subject No. 24 of the Agenda.) (Appendix XXII.)

The subject was opened by Dr. Lander who briefly explained the decisions arrived at by the Sub-Committee.

The Chairman expressed the view that the time had now arrived when as the introduction of high-yielding varieties of commercial crops progressed thus providing the required yield from a smaller area more land should be proportionately released for growing fodder crops. He also stressed the necessity for a quantitative estimate of the fodder available in each province.

The questionnaire recommended by the Sub-Committee was then discussed in detail and Mr. Ware suggested that this questionnaire which he understood had not been circulated in the Provinces, needed further consideration.

Mr. Parr suggested that the required figures could be ascertained from the Season and Crop Reports, but the Chairman pointed out that these reports do not give the detailed information required. A new system of classification of reports was then suggested by Mr. Parr.

Dr. Wright was of the opinion that the information to be collected should be available for each district separately.

The Chairman suggested that Local Governments should first be consulted in the matter and that their recommendations might be considered by a special Sub-Committee.

Mr. Achar desired that the Indian States should be included in the enquiry.

Col. Olver agreed that the questionnaire would not by itself supply the information and suggested that the Imperial Council of Agricultural Research should convene a small sub-committee of the Advisory Board to go through the questionnaire before it was circulated. This was put to the Board and carried unanimously.

The other recommendations of the Sub-Committee on this subject were accepted by the Board.

18. To discuss the possibilities and results of utilising surplus molasses as cattle feed. (Subject No. 25 of the Agenda.) (Appendix XXIII.)

The Chairman drew the attention of the Board to the fact that a large sugar industry was rapidly growing up in the country and that a very large surplus of molasses was already available in India. It was therefore urgently necessary to find suitable uses for such a surplus. He mentioned the experiments in progress at the Imperial Institute of Sugar Technology on the utilisation of molasses absorbed in coarse fodders.

Dr. Lander explained that owing to the very insufficient data already available in this country it was not possible to make any definite recommendations unless further carefully controlled experiments could be carried out. The findings of the Committee were recorded.

19. To discuss the best methods for co-ordinating the work of the Central Animal Nutrition Section, Izatnagar, and similar institutions in the Provinces, and to suggest ways by which the Central Institute could best function as the Central Bureau for dissemination of information. (Subject No. 26 of the Agenda.) (Appendix XXIV.)

The recommendations of the Sub-Committee were explained by Dr. Lander and were accepted by the Board.

20. To discuss the control of Equine Abortion in Indian studs, with special reference to the role of minerals in this disease. (Subject No. 27 of the Agenda.) (Appendix XXV.)

Dr. Lander laid the findings of the Sub-Committee before the Board and Dr. Sen pointed out that all the available information, so far, was limited to a few empirical observations. Mr. Quirke enquired when it would be possible for Muktesar to carry out preliminary investigations in the Punjab. To this Mr. Ware replied that when the complete staff of the Animal Nutrition Section and the specialist officer for the study of abortion were available this question would receive urgent attention.

Mr. Parr inquired if this promise of help included the subject of bovine abortion, from which United Provinces sustains considerable losses. Mr. Ware replied in the affirmative.

Mr. Shirlaw said that in his opinion the causative role of nutrition with regard to the equine abortion was being over stressed.

The report was adopted by the Board.

21. To discuss the present position of the work in different parts of India on the effect of mineral feeding in dairy animals, from the standpoint of production and prevention of disease. (Subject No. 28 of the Agenda.) (Appendix XXVI.)

Dr. Lander stressed the importance of long term experiments being carried out at a central laboratory and Dr. Sen remarked that there was no reason why this work should not be supplemented by simultaneous work at provincial centres.

Mr. W. Sayer drew attention to the statement that John's disease could be controlled by proper feeding. This disease had become a source of terror in dairy herds and it was important to obtain definite information as to the possibility of controlling it.

Mr. Ware stated that John's disease appeared to have been reduced in the Muktesar dairy herd by mineral feeding but they had had no opportunity of making postmortem examinations. The information available from abroad indicated that the position at present had not reached the stage of practical application.

After discussion the report of the sub-committee was adopted with a minor alteration in line 6 of page 5 which was amended to read as "Promising results have been obtained" instead of "can be ameliorated or prevented".

22. Sets of formulae to be employed in connection with experiments on Animal Husbandry and control of Diseases. (Subject No. 37 of the Agenda.) (Appendix XXXII.)

Dr. Lander in introducing this subject said that a note or notes dealing with the elementary aspects of statistical control was needed rather than sets of formulae, as suggested in the article. He pointed out that the training of the Animal Husbandry Research workers was more biological than mathematical and as such very simple treatment of the principles of statistics was required.

Dr. Burns emphasised the same point. He said that the idea should be to remove statistics from the realm of mystery rather than to produce statisticians amongst research workers. A small handbook could very profitably be produced.

Dr. Wright was asked whether he considered that such a publication would be of value. He replied that the subject of Biometrics was to some extent dealt with in their courses of training and that the information available showed that it could be made more use of. He considered that such a note as had been suggested would be likely to be of value in other countries as well as in India.

Mr. Ware suggested that perhaps it would be better if the Imperial Council of Agricultural Research could make arrangements for deputing either the statistician or one of his assistants to lecture to the Animal Husbandry post-graduate classes which are annually held at Muktesar. Sir Bryce Burt replied that he could see no objection to this. It might also be possible to get the assistance of Professor Mahalanobis. He promised that a lecturer would be arranged for the purpose at Muktesar when required. The report of the Sub-Committee was adopted.

REPORT OF THE VETERINARY EDUCATION SUB-COMMITTEE.

23. To consider the desirability of employing stockmen to supplement the work of Provincial Veterinary Departments in carrying out vaccination, castration and other livestock improvement work and to make recommendations for the training and supervision of these men. (Subject No. 2 of the Agenda.) (Appendix II.)

Mr. Ware opened the subject and explained the necessity for employing stockmen to supplement the work of existing veterinary staff in various provinces. He considered that the course of instruction should not exceed six months, but did not think that it mattered much if these stock assistants were of the matriculate standard or below it. Mr. Kerr supported the suggestion and said that a man of low grade pay was

essential to supplement the work of live-stock improvement in Bengal because it was not possible to pay a sufficient number of veterinary assistants. Personally he preferred the term "Stock-men" but suggested that as an alternative the word "Salutri" might be employed. Veterinary Hospitals were too few and it was essential to seek the help of such men for such work as castration and inoculation. Mr. Quirke was of the opinion that the provinces should seek their own salvation and that in his case there was no necessity to make such a recommendation to the local Government. Mr. Badami explained that the system of employing such stock-men was already in existence in the Hyderabad State but he was of the opinion that the period of training should be increased to one year and the educational qualification to the middle standard.

Mr. Kailasam Iyer opposed the employment of such men as he thought that this would increase quackery. He stated that as rinder-pest was definitely on the decline in the Presidency, there was no necessity to have such extra staff. Moreover as efforts were being made to raise the standard of veterinary education in India, it would be a step in the wrong direction to employ such men. Further that there was a danger that local bodies when they found that they could get cheaper men might prefer to employ stock assistants in preference to Veterinary Assistants. Mr. Saunders said that the above opinion was a personal one and was not the view of the presidency. He knew that there were a number of Veterinary Graduates still unemployed but these men would first be provided for. It was to be understood that stock assistants would be posted to veterinary hospitals and would work under supervision of veterinary assistants. They would not be expected to diagnose cases or to undertake responsible work. Colonel Olver pointed out that if Animal Husbandry work was to be extended on the very large scale which was needed in this country it was not possible to do without such men. Sufficient numbers of veterinary assistants were not available and they could not in any case be employed in such large numbers as were needed. He did not agree with Mr. Badami's suggestion that a year's training should be given. If that were done there might be danger that these men would pose as qualified veterinary assistants. The essential point was that Provincial veterinary departments required lowly paid assistants, for such work as castration and inoculation, who could be employed in comparatively large numbers and it would be a mistake to give them extended courses of instruction.

Mr. Garewal said that the procedure, if adopted, would be highly dangerous as these men would treat cases in the villages without being fully trained. Mr. Taylor replied that such men were already working in veterinary hospitals and were needed to carry on the treatment of cases when the Veterinary Assistants went on tour. The report of the sub-committee was adopted.

24. To consider revision of different tables now contained in the Annual Reports of the Directors of Veterinary Services in the various Provinces and Constituent States with a view to make them more complete and uniform so as to facilitate their interpretation and the compilation of all-India statistics. (Subject No. 3 of the Agenda.) (Appendix III.)

Mr. Ware explained why it was necessary to bring up this subject for discussion. He thought that more information and statistical information regarding animal husbandry were necessary and that more uniformity

was required in this presentation. The recommendations of the committee were accepted.

25. To consider arrangements that should be made to enable veterinary students to take up training in dairying at the Central Dairying Institute. (Subject No. 4 of the Agenda.)

The Chairman first explained that as recommended by the Agricultural Commission it was desirable to improve the standard of dairy education in this country. It had, therefore, been decided that preliminary dairy education should be given at provincial colleges and that advanced training should be given at the Central Institute in Bangalore. After discussion it was decided that as soon as the detailed syllabus was ready it should be circulated to Provincial and State Governments for opinion.

REPORT OF THE ANIMAL INDUSTRY SUB-COMMITTEE.

26. Marketing of Livestock and livestock products. (To consider the conclusions of the Livestock Reports of the Agricultural Marketing Adviser.) (Subject No. 19 of the Agenda.) (Appendix XVII.)

Mr. Samuel presented the report of the Sub-Committee. Mr. Wynne Sayer considered that it would not be practicable to classify draught cattle as was proposed into light, medium and heavy. He thought that classification should be by breeds. Mr. Bruen considered that classification should be on a quality basis for each breed.

The President suggested that details of classification be left over until the complete cattle survey report had been received from the Agricultural Marketing Adviser. The Board accepted this suggestion and recorded the note submitted by the Agricultural Marketing Adviser.

27. Selective indigenous breeding versus cross breeding with imported poultry for commercial egg production. (Subject No. 20 of the Agenda.) (Appendix XVIII.)

Mr. Samuel in introducing the report of the Sub-Committee stated that he considered that there was scope for the commercial production of large eggs. Mr. Bruen doubted whether any of the recommendations made in the note were practicable and Mr. Read considered that experiments were needed before any definite recommendations could be made. This view was accepted and Mr. Nurul Islam's note was recorded.

28. Grading of hides and skins and the development of the Hides and Skins industry in India. (Subject No. 21 of the Agenda.) [Appendices XIX(a) and XIX(b).]

The Chairman remarked that item No. 1 of the Sub-Committee Report was merely a statement of fact and need not be discussed. In dealing with item (2) Mr. Ware suggested that "in collaboration with Imperial Veterinary Research Institute, Muktesar" be added after the words "immediate action" in view of the fact that work in this connection was already in progress at Muktesar. This was agreed to and the Board desired to emphasise the great economic importance of the damage done by the Warble Fly. Mr. Das suggested that in the working of recommendation No. 2 stress be laid on the desirability of adopting such combative measures against warble flies in India as had been found successful in other countries, e.g., Denmark.

Mr. S. K. Sen referred to the recommendations already made by the First Meeting of the Animal Husbandry Wing of the Board of Agriculture in regard to the investigation that is to be undertaken on the warble fly pest in India and said that work on those lines was already in progress or about to be taken up at Muktesar. He referred to the Report of the Hides Cess Enquiry Committee wherein the expression "adaptive research" had been used in the chapter dealing with the subject of warble flies. By this term the Committee presumably intended to stress the desirability of adapting to the needs of India the type of research that had been carried out on these points in other countries. Whatever may have been the intention of that Committee, it appeared to be recognised that there was a genuine need to undertake intensive research upon the bionomics and life-history of warble flies in this country before embarking upon a scheme for the control of these pests; for it was possible that the habits of warble flies in India might differ in essential points from what is known about them in other countries. Mr. Sen then briefly recounted the life-history of *Hypoderma lineatum* and referred to the fact that no explanation has as yet been offered as to why the pest was prevalent in certain localities and almost entirely absent from others. Mr. Das considered that it was unnecessary to wait before taking action. Mr. Quirke said that measures were already being taken in the Punjab and suggested that the trade should be approached for funds. Items 1-4 of the report were adopted by the Board but item (5) was deleted as it was stated by Mr. Quirke, in answer to Colonel Olver, that the chemical brand which had been tested at the Hissar farm had not proved satisfactory.

29. Salvage of dry cows from city dairying. (Subject No. 22 of the Agenda.) (Appendix XX.)

As regards the Salvage of good cows from premature slaughter in cities it was explained by provincial representatives that the position was different in each province, and the Chairman suggested that a small committee should go into the question. This suggestion was accepted and it was agreed that the composition of the Committee should be as follows:

Animal Husbandry Expert. (Chairman),

Mr. Kerr,

Mr. Littlewood,

Mr. Bruen, and

Mr. Kothavalla.

It was agreed that the members of this Committee should communicate with each other to save time and should, if possible, meet at the time of the next Advisory Board.

The report of the Sub-Committee was adopted.

30. In regard to the problem of facilities for cattle, etc., it was explained that the freight rate on cattle and cattle products was already the least remunerative of all. The Committee accordingly agreed that the paragraph recommending that Agricultural Departments should attempt to secure a general reduction of these rates and the succeeding paras should be deleted.

31. To discuss the development of the Wool and Hair industries in India. (Subject No. 23 of the Agenda.) (Appendix XXI).

After the report of the Sub-Committee had been presented by Mr. Samuel a proposal was put forward that a wool survey should be carried out, but after discussion it was decided to await the report of the marketing survey. The report of the Sub-Committee was adopted accordingly.

REPORT OF THE DAIRY SUB-COMMITTEE.

32. To consider whether the time is ripe for the formation of breed and milk-recording societies in India as an aid to developing high milk-yielding strains of the more important Indian breeds of cattle and enhancing the prices of recording pedigree stock. (Subject No. 29 of the Agenda.) (Appendix XXVII).

After Mr. Kothavalla had introduced the subject Mr. Bruen stated that in his opinion what was most needed now was publication of the records of outstanding animals so that prospective purchasers might know what cattle were available. Colonel Olver explained that this had already been provided for and would be undertaken by the Animal Husbandry Bureau, the records being published in one of the journals of the Imperial Council of Agricultural Research.

The report of the sub-committee was adopted unanimously.

83. To discuss the correlation of Central Pedigree Herd Books with methods of provincial registration. (Subject No. 30 of the Agenda).

In the course of discussion it was decided that in recommendation No. 1 the words "deal with those" be used instead of "interest themselves in". With this amendment the Report was adopted.

34. To discuss the importance of buffaloes to the dairy industry and their place in the general agriculture of the country. (Subject No. 31 of the Agenda.)

Mr. Kothavalla introduced the report of the Sub-Committee and after discussion it was agreed that the wording in regard to the buffalo in the penultimate sentence on page should be changed to read "it gave milk of higher fat content than the cow". With this amendment the report of the Sub-Committee was accepted.

35. Action taken on the recommendations of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry at its first meeting held in 1933. (Subject No. 32 of the Agenda.) (Appendix XXVIII.)

The note on this subject was accepted and recorded.

36. Report of the progress of the Committee appointed on the recommendation of the First Animal Husbandry Wing Meeting on the question of (a) All-India Dairy Legislation; and (b) Legislation for Meat Inspection. (Subject No. 33 of the Agenda.) (Appendix XXIX.)

To make the situation clear, the Chairman pointed out that the Central Government under Federation would not be in a position to institute legislation on these subjects and in the course of discussion it was pointed out that legislation already existed in most provinces and States. The feeling of the meeting was that such legislation would have to be provincial and Colonel Olver pointed out that any legislation which might

be suggested by the Central Government would have to be of a permissive nature. The present intention was to draw up codes which could be issued to provinces and States with a recommendation from the Central Government that they should be locally applied.

This was agreed to.

37. To discuss the employment of unqualified castrators by Government Departments to carry out castration other than under veterinary supervision. (Subject No. 36 of the Agenda.) (Appendix XXXII.)

Mr. Ware in presenting his paper drew attention to the following points:—

In the past castration had been done in this country by the cruel method of mulling, and the Veterinary Departments had introduced improved methods by which this operation could be more expeditiously and efficiently carried out with a minimum of pain and no loss of blood. It should not, however, be assumed that castration could be satisfactorily carried out without expert supervision.

He pointed out that in certain countries castration had been made by law a major operation, and an offence, if performed by anyone not duly qualified. He considered that the proposed wide extension of castration work by local Governments need to be carried out in a properly regulated manner and that proper courses of training and veterinary supervision were necessary if untrained men were to be employed. The course of training already suggested should meet the case.

Mr. Bruen considered that castration was not a serious operation. Thousands of Small-Pox vaccinations were carried out in human-beings by inoculators who had received little training and were not subject to professional supervision.

Mr. Parr considered that the proposal, if adopted, would hinder live-stock improvement work. In the United Provinces castrators had been trained at Provincial Farms and were doing satisfactory work. Castration was a simple operation for which no surgical skill was required. He considered that Burdizzo Castrators should be supplied to villages in the same way as agricultural implements were supplied. There would be no difficulty in training villagers to carry out the operation.

Mr. Kerr considered that the need for expansion of staff was obvious, in order to carry out the required number of castrations and inoculations. For that reason he had supported the proposal made under item (2) of the Agenda to employ properly trained stockmen for such work.

The Chairman said that there was no question as to the necessity for more castrations but the points to be decided were (1) if trained stockmen should be employed for this work, or (2) if on humanitarian grounds Burdizzo Castrators should be issued to villages, with a view to doing away with mulling.

In answer to the remarks of Messrs. Bruen and Parr, Mr. Ware stated that he had seen cases in which animals, supposed to have been castrated by the Burdizzo Castrator, had not been properly sterilized, with the result that the unfortunate animals had been put to a great deal of unnecessary pain and were still a nuisance. He considered that all castrations carried out by Government should be under veterinary supervision.

Mr. Badami emphasised the importance of periodical inspection of the Burdizzo Castrator as otherwise it was liable to become cruel and ineffective. He had seen instances in which injury to the animal and prolonged suffering had been caused by inexperienced castrators. He insisted that castration should be carried on under veterinary supervision.

The Chairman then asked if the purchase of Burdizzo Castrators by stockowners should be encouraged. Dr. Wright emphasised the need for more castrations in any campaign for the improvement of livestock.

In answer to an enquiry Mr. Quirke stated that the Punjab Veterinary Department was in a position to train cattle owners to castrate their animals, if necessary.

The Chairman said that the sense of the meeting was that the use of the Burdizzo Castrator should be extended and that villagers might be trained in its use but that all such castrators should work under veterinary supervision.

38. The position of Animal Husbandry in India. (Subject No. 35 of the Agenda.) (Appendix XXXI.)

In opening the discussion Col. Oliver stated that he had again raised this very controversial subject in order to endeavour to secure a more effective organization for the development of livestock and animal industry throughout India. Official aid in livestock improvement required to be provided in India on a much more extensive scale than in other countries, because there was nothing to take the place of the pioneer breeders of pedigree livestock who, assisted by the wealthy landowners of England, had built up the very remunerative export trade in such stock which had enabled the British farmer to produce at profit a great variety of pure breeds of the highest class. To a certain extent a similar export of indigenous cattle had existed in India in the past but for a variety of reasons this trade had almost been lost. With effective control of disease and breeding it might be possible to revive it but in any case the internal market, for working bullocks and milch cattle, was the most important consideration. To produce these in large numbers and of the quality which were needed far more extensive Animal Husbandry work was urgently necessary and it seemed clear to him that more use would have to be made of the existing Veterinary Departments, along with such livestock personnel as existed, and to build up Provincial and States Animal Husbandry Departments similar to those which had been so successful in other countries.

From the figures he had given the amounts spent on livestock improvement were, in the majority of Provinces, obviously far too small and he felt that it was his duty to draw attention to the position.

In this connection he wished to mention that the impression given by the wording of his note on item 13 of the Agenda, that the services and progeny of the 13,000 approved bulls in service in the Punjab were all recorded by the Veterinary Department, was incorrect. They were recorded in the special breeding tracts only but it was true that the breeding of the young-stock produced by these bulls could generally be traced.

In any case the amount of systematic Livestock improvement work carried on was far greater in the Punjab than elsewhere. In other Provinces corresponding Animal Husbandry organisations devoted to Livestock interests were lacking and it seemed certain that Provincial or State

Governments would not be able to afford separate Departments for live-stock improvement work in addition to the already existing Agricultural and Veterinary Departments. He therefore considered that the existing Provincial and State Veterinary Departments would have to be the basis on which to build up the Animal Husbandry Departments which he had advocated but, as he had stated in his note, the position of existing live-stock personnel and staff would have to be safeguarded. Who should control these Departments would be for Provincial or State Administrations to decide and must depend largely on the comparative experience and administrative capacity of the Director of Veterinary Services and other senior officials, who were suitably trained and in a position to devote themselves solely to the care and development of Livestock.

From his experience since taking up his present appointment he was convinced that it was essential in every Province or State to build up, from such veterinary and livestock personnel as existed, Provincial and State Animal Husbandry organisations, under the unified control of suitably trained specialists who had no countervailing interests to consider.

Mr. Bruen said he would like to ask one small question.

Why if the veterinarian was the right person to control dairy does the Army Veterinary Corps not control the Military Dairy Farms?

If we could get an organisation which would ensure full co-operation of all the Departments concerned he would welcome it but instead of an Animal Husbandry Department composed of the Veterinary Department and Livestock staff he would prefer a separate Animal Husbandry Department in addition to the existing Agricultural and Veterinary Departments.

Mr. Kerr said that he wanted an Animal Husbandry Department to deal with all live-stock matters because more was needed to be done and he would be able to get more assistance from the available staff if Animal Husbandry Departments were formed.

Members of one Department were liable not to wish to carry out work for another but he always insisted that his staff should give every assistance in whatever work was required.

Mr. Ware said that this subject was in danger of becoming a hardy annual and in order to endeavour to obtain agreement he suggested the following points for consideration, *viz.* :—

1. That the present staffs for live-stock improvement work were inadequate for the development required.
2. That all possible use should be made of all suitably trained staff available in Provinces and States.
3. That it was recognised that administrative questions might prevent the same organisation being set up in each province but the principle to be adopted was that all staffs employed on the development of Livestock Industries should be subject to unified control.

Mr. Parr thanked Mr. Ware for his olive branch and welcomed Mr. Bruen's suggestion to work out some organization in which all branches would get a fair chance. But in view of the fact that in relation to almost every item the need for more veterinary research and staff had been stressed he felt that Provincial Veterinary Departments would be unable to devote sufficient attention to livestock improvement.

The Chairman said that what was wanted was an adequate Animal Husbandry organization whose officers would have the necessary qualifications but he considered that the unifying element should be the Minister-in-charge of Agriculture. He mentioned that in Canada Dairying was dealt with by a separate Bureau.

Mr. Wynnè Sayer said that it was well-recognised that judges of livestock were born and not made but he had found veterinary graduates the most suitable material available in India for such work. He had two Veterinary Graduates now in charge of his herds and he was training another.

He pleaded that all cattle breeding work should be placed in charge of those individuals who showed a natural capacity for the work and not confined to any particular service or class, as this was the only way to secure satisfactory progress.

Mr. Ware said that every possible use needed to be made of all suitably trained personnel available and wished to move his three points, previously mentioned, as a formal resolution.

The Chairman said that the expression "unified control" in the last sentence was too vague and if intended to be precise was objectionable. The debate showed that there was no agreement as to what Department should exercise control.

He agreed that some better organisation than at present was needed for the improvement of livestock and thought that there might be agreement to a suggestion he would put forward that instead of amalgamating existing Provincial Veterinary and Livestock Personnel into Provincial Animal Husbandry Departments three Departments should eventually be formed in each Province or State *viz.*, Agriculture, Veterinary and Animal Husbandry.

This proposal was not acceptable to some members and the Chairman said that as the meeting was not a representative one and there was no measure of agreement he would not put any formal resolution.

The subject was accordingly talked out.

39. International Convention relating to trade in Livestock and Livestock products. (Subject No. 38 of the Agenda) (Appendix XXXIV.)

The note by Mr. Aggarwala was recorded.

The Chairman moved a resolution of thanks to the Madras Government and the officers of the Madras Veterinary and Agricultural Departments for inviting the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India to Madras and for placing the College at their disposal for the meeting. The resolution was heartily supported by Colonel Olver and carried with acclamation.

The meeting then dispersed.

N. C. MEHTA,

Secretary.

SUMMARY OF RECOMMENDATIONS.

Subject No. 1.—(a) A course of instruction upto the highest standard of veterinary education is necessary in India.

(b) A separate Central College should be built and equipped for this purpose.

(c) This College should be located at Izatnagar in consideration of the manifold facilities provided by that place.

Certain recommendations in regard to recruitment to and subjects for study at the Central Veterinary College were also made by the Board.

*Subject No. 2.—*Properly trained Stockmen, working under Veterinary Supervision, should be employed to supplement the work of the Provincial Veterinary Departments in carrying out castration, vaccination and other live-stock improvement work. They need not necessarily be matriuulates but should be able to read and write labels and other ordinary things in English and be recruited from amongst agricultural classes interested in livestock. Their pay should preferably be Rs. 25— $\frac{1}{2}$ —35, service non-pensionable and they should be trained either at large district hospitals or Veterinary Colleges, whichever convenient, over a period of six months.

Subject No. 3.—(a) For the purpose of collecting all-India statistics, the tables appended to the Annual Reports of the Provincial Veterinary Departments should be uniform.

(b) In future the tables should be arranged in the order in which they are shown in the note on the subject.

(c) The inclusion in the Annual Reports of any statements showing the working results of live-stock farms or special experiments or investigations should be left to the discretion of the provinces concerned and when included they should be placed after Table XI.

Certain alterations in the various tables appended to the note were also suggested.

*Subject No. 4.—*As soon as the detailed syllabus for the two parts of the contemplated I D. D. courses is ready, it should be circulated to Provincial and State Governments for opinion.

Subject No. 5.—(a) Before arriving at a conclusion as to whether the Goat Virus should be used for general prophylaxis or for outbreak control only, further experience is required.

(b) It is necessary to know whether it would be possible in India to establish "Rinderpest free areas" and if so what would be the effect on such areas should Rinderpest be accidentally introduced after a considerable period of immunity.

(c) For the control of outbreaks it is agreed that Goat Virus and Vaccine are generally safe, efficient and the most readily applied methods of dealing with Rinderpest in Indian cattle. For buffaloes, these methods require more investigation, province by province, district by district, in each breed. At present a control dose of Serum given simultaneously with the Vaccine would be safer than Vaccine alone.

(d) All good cattle and buffaloes and improved animals should receive prophylactic treatment.

(e) India should be mapped out to show the areas in which the disease is enzootic.

Subject No. 6.—No recommendations. Need for further research emphasised.

Subject No. 7.—Information of the routine methods of differential diagnosis should be circulated by the Imperial Veterinary Research Institute to the workers in the field.

Subject No. 8.—The early appointment of an officer with special training in anaerobic work is urgently needed. Diagnosis of outbreak should be carried out at Provincial Laboratories and confirmed by a specialist. Mapping of enzootic areas in provinces according to casual organisation should be carried out. Special prophylactic inoculation should be adopted as far as possible.

Subject No. 9.—Further systematic study of these diseases, their relationship, casual factors and control is urgently needed.

Arrangements should be made for the collection of all available information from all investigators engaged on the subject, and whether the results are tentative or otherwise it should be circulated amongst the workers.

Subject No. 10.—Further investigation in the provinces in regard to the incidence and control of diseases of sheep and goats that are important from the point of view of export of these animals from India, is called for and the attention of Disease Investigation Officers may be drawn to this subject in the first instance. Later special study will be necessary at the Central Institute.

Subject No. 10-A.—The note on the establishment of quarantine stations at the principal ports of India should first be considered by the Committee which dealt with the Contagious Diseases of Animals (India) Act, and should then be circulated to provinces by the Imperial Council of Agricultural Research with a view to eliciting their opinions.

Subject No. 11.—Further study is necessary with regard to the incidence and spread of the disease, including the mapping out of enzootic areas.

Measures of control recommended:—

- (a) the use of anthrax spore vaccine to stop outbreaks, and
- (b) also for prophylaxis in enzootic areas.

In addition Civil Veterinary Departments' rules for the disposal of carcasses should be more stringently applied.

Subject No. 12.—An enabling act for compulsory castration would be an advantage in most provinces and States provided it is tactfully administered as the act could be effectively enforced only where the great majority of breeders were agreeable and where an adequate supply of good bulls is available for service.

Subject No. 13.—(a) Wherever bulls are provided by Provincial or District Cattle Breeding Associations it is essential that provision be made from the same source for their maintenance.

(b) In order to carry on continuous improvement it is necessary that the services and accredited progeny of approved bulls shall be recorded, as accurately as possible. For this purpose it is necessary to employ

extra breeding staff at the rate of 1 Inspector per 50 bulls. It is not however considered feasible to carry on milk-recording without special staff.

(c) It is not possible at present to carry out strict registration of pedigree stock under average village conditions of breeding.

(d) Where the cattle of an area are sufficiently pure the recording of approved stock in official herd-books should be taken up provincially. Such recording would be quite distinct from the official registration of pedigree stock of 7 breeds which is now being taken up by the Imperial Council of Agricultural Research.

(e) In order to effect cattle improvement on a broad scale it is necessary to greatly extend controlled breeding in areas where definite types exist and that subsequently, as large numbers as possible of selected bulls from these areas should be employed in areas where at present there is no definite type.

(f) A great deal of good could be done if the herds maintained in jails, mental hospitals etc., at Government expense, and at Pinjrapoles are more extensively utilised for the breeding of pedigree stock and at such institutions strict milk recording should be feasible. Inducement might be given to Military Dairy Farms to rear the best of their young male stock, of indigenous breeds and to suit their breeding policy as far as practicable to the accepted policy of the country *viz.*, the improvement of indigenous breeds. Small herds of purebred indigenous dairy cattle should be maintained at Government Seed and Demonstration Farms.

(g) For the present free service should, as a rule, be given, but in certain provinces the system of charging fees should be developed.

(h) Funds collected in response to His Excellency the Viceroy's appeal should be placed at the disposal of the Department in charge of the Live-stock work of the Province and they should not be merged in other local funds.

Subject No. 14.—(a) In order to develop sheep breeding on a broad scale, the first thing to be done is to induce non-migratory flock owners to take up the breeding of pure bred indigenous sheep.

(b) Each province should, as far as possible, maintain at a central farm, nucleus flocks of all indigenous breeds which are of economic importance in the province.

(c) For extensive work in the districts demonstration flocks of these breeds consisting of 50 ewes and two rams each, might be issued to selected breeders for breeding pure bred stock under suitable controlled conditions.

(d) The financing of such demonstration flocks should be a legitimate object on which to expend village uplift funds.

Subject No. 15.—(a) All information should be obtained from Military Dairy Farms, the Government Cattle Breeding Farm, Karanah, etc., regarding the use of dips and the results achieved.

(b) The Concrete Association of India should be asked to furnish information as to the design and cost of dips and as to what facilities the Association would be prepared to give if the provision of dips were undertaken in this country on an extensive scale.

(c) Demonstration dips should, wherever possible, be established at Government cattle breeding farms and used for propaganda purposes.

(d) Recommendations made by the author should be considered when more information is available.

Subject No. 16.—Approved cattle should be branded on the cheek with a specified mark to indicate that they are selected improved stock. Further marking for individual identification should be done by tattooing in the ear. If branding is to be carried out on the hides it should be done on the neck.

Subject No. 17.—No recommendations. Necessity for scientific research with Indian live-stock emphasised.

Subject No. 18.—When the proposed Genetics Institute is established the subject of artificial insemination would be another line of work which should be taken up immediately.

Subject No. 19.—(a) Details of classifying the type of working animals into light, medium and heavy, such as by measurements, age etc., with reference to the various breeds should be left over until the complete cattle survey report had been received from the Agricultural Marketing Adviser to the Government of India.

(b) Information about the rate of fee charged for each animal allowed into the grounds of cattle fairs and markets should be included in the annual calendar of fairs etc.

(c) The licensing of brokers should be considered for recognised cattle fairs and markets.

Subject No. 20.—No recommendations. Need for further research emphasised.

Subject No. 21.—(a) In the areas affected by warble flies the Provincial Governments concerned should consider and take immediate action in collaboration with the Imperial Veterinary Research Institute, with regard to warble fly infestation and implement schemes for the elimination of the warble fly.

(b) A step in the right direction to improve the defects in hides would be to have a standardized grading system for the internal trade in hides and skins, which must be finally decided after a conference of shippers, tanners, hides and skins dealers and others interested in the trade and thereafter to initiate more hides and skins grading stations at important trade centres.

(c) Investigation regarding control of ticks on livestock should be taken up at an early date.

Subject No. 22.—A small committee should go into this question again at the time of the next meeting of the Advisory Board.

Subject No. 23.—(a) A simple system of grading wool should be devised for the proper development of the wool industry.

(b) Facilities for washing sheep may be provided at sheep shearing centres.

(c) Report of the Marketing Survey should be awaited before carrying out a wool survey.

Subject No. 24.—The questionnaire prepared by the Animal Nutrition Committee with the specific object of obtaining, as far as possible, a statement showing the available fodder crops for the stock of each province, preferably district by district, should be examined by a sub-committee of the Advisory Board before it is circulated.

Subject No. 25.—No recommendations.

Subject No. 26.—The consideration of the question should be deferred till the report of the British Experts is available.

Subject No. 27.—(a) Action should be taken to collect information from private and Government stud farms in India as to the occasions on which the disease has been pronounced, the treatment from the nutritional point of view and the results which have been obtained.

(b) The Central Institute of Animal Nutrition should investigate scientifically the disease, wherever and whenever it occurs.

Subject No. 28.—(a) The Central Institute of Animal Nutrition should carry out long period investigations on dairy stock from birth up to 4th lactation in order to ascertain what the mineral requirements of these animals in conditions of health are.

(b) *Pari-passu* with these investigations, the Institute should give assistance to the provinces, and in the light of its own experimental information should investigate cases which come to light indicating that mineral deficiencies are responsible for mal-nutrition and disease in dairy stock.

Subject No. 29.—(a) The time is ripe for the information of breed and milk recording societies as an aid to developing the dairy industry of the country.

(b) There is great need for educating the public on the advantages of using pedigree stock, and that this kind of propaganda can best be carried out through a central agency for which necessary facilities should be provided.

Subject No. 30.—(a) The Central Pedigree Herd Books should deal with those milch breeds of cattle which are of all India importance and should lay down forms, methods, rules, etc., for registration of such breeds to be followed by the provinces.

(b) The application for registration of animals of such breeds should be made to Provincial organisation in the first instance who, after verification, should pass it on to the Central organisation with necessary recommendations.

(c) In order to accelerate the move for registration, for the first 1½ years of the starting of the Herd Book, no charge should be made. Thereafter a fee of about Rs. 2 should be levied on each animal registered.

Subject No. 31.—(a) The buffalo as a dairy animal has established itself throughout India and for the development of the dairy industry, it is indispensable.

(b) Adequate attention has not so far been given to the development of the various breeds of buffaloes and that the time has now come for making a serious effort at developing the important breeds.

(c) The male stock is of great utility in certain types of cultivation, as such the buffalo has an important place in the general agriculture of the country.

Subject No. 32.—No recommendations.

Subject No. 33.—Legislation in regard to dairy matters would have to be provincial and any legislation which might be suggested by the Central Government would have to be of a permissive nature. The present intention should be to draw up a code which could be issued to provinces and States with a recommendation from the Central Government that it should be locally applied.

Subject No. 34.—(a) There is scope for further improvement in the quality and quantity of grazing produced by forest lands of the type which at present carry principally poor pole scrub or thorn forest and for the improvement of the amenities of grazing by the provision of better water-supplies.

(b) Such improvement can only be effected by the provision of scientific management by a competent staff.

(c) Power to control both periods of closure and numbers utilizing the grazing is absolutely essential to proper management and should be provided, if necessary, by legislation.

(d) Proper management must involve expenditure which will not be immediately remunerative, and from which even the ultimate returns will very probably be mostly indirect. The mode of provision of the necessary funds should be decided by Government. Such expenditure should not be imposed as a further burden upon the budgets of commercial or quasi-commercial departments.

(e) There is great scope for the introduction of proper management in lands which up to the present time have been outside the orbit of the activities of any of the technical departments.

(f) The organization of such improvements should vest in special Standing Fodder and Grazing Committee to be formed in each province and their activities should be co-ordinated by a new Fodder and Grazing Subcommittee of the Imperial Council of Agricultural Research.

Subject No. 35.—No recommendations.

Subject No. 36.—The use of the Burdizzo Castrator should be extended and villagers might be trained in its use but all such castrators should work under veterinary supervision.

Subject No. 37.—(a) The Statistician to the Council should prepare a note or notes dealing with the elementary aspects of statistical considerations.

(b) There should be no objection to any research worker in animal husbandry submitting the layout of his researches to the Statistician for help and advice as to how far the results likely to be obtained from any given plan might be amenable to statistical interpretation.

(c) Statistician or one of his assistants or Professor Mahalanobis may be deputed to lecture to the Animal Husbandry post-graduate classes which are annually held at Muktesar.

Subject No. 38.—No recommendations.

APPENDIX I.

NOTE ON SUBJECT No. 1—BY COL. A. OLVER AND CAPT. A. C. AGGARWALA.

VETERINARY EDUCATION IN INDIA.

PRESENT POSITION.

There are at present five Veterinary Colleges in India, namely, at Lahore, Patna, Calcutta, Madras and Bombay, controlled and financed exclusively by the Local Governments concerned. The course of instruction imparted at these institutions, except at the Punjab Veterinary College, Lahore, runs over a period of three years and the minimum qualification for admission aimed at is matriculation. These courses are meant to train young men as veterinary assistant surgeons to hold appointments in the subordinate grades of the provincial veterinary services. At the Lahore College the course is of four years' duration with Intermediate standard as the minimum qualification for admission. This College also turns out veterinary assistant surgeons.

Although some Directors of Veterinary Services and Principals of Veterinary Colleges concerned consider that their standards "compare not unfavourably with those required for the M. R. C. V. S. Diploma in the United Kingdom", the fact remains that the existing veterinary colleges in the country are not fully equipped as regards laboratory accommodation and general facilities and as regards the academic and professional qualifications of the teaching staffs employed. Moreover, Indian students start their courses of veterinary training at the Indian veterinary colleges with a varying standard of general education and usually with an imperfect knowledge of English. It cannot therefore be expected that with courses of training of 3 or 4 years' duration only and much less complete and less well-qualified teaching staffs, the same standards of professional training and efficiency will be reached as are demanded of veterinary graduates in the United Kingdom.

PROVISION FOR BETTER AND ADVANCED VETERINARY EDUCATION REQUIRED.

India, as a predominantly agricultural country, depending mainly on her livestock for the common and essential amenities of life, has long suffered from the ills that inevitably result from the inadequacy of her veterinary force, which, in turn, depends mainly upon the standard of training at institutions meant for the purpose. The Royal Commission drew attention to this (paragraph 250) and made concrete recommendations: that for an enlarged and more efficient veterinary service, two types of courses are necessary in India: (a) for training veterinary assistant surgeons at the existing veterinary colleges, and (b) a central college for imparting advanced training in Veterinary Science.

The question of raising the standard of veterinary education in India to a standard approximating that of the M. R. C. V. S. has long been under the consideration of Government. It was fully recognised that apart from the national question of maintaining a sufficiently high standard for those who are to hold the highest posts in the Indian veterinary services, it was necessary to see that the qualifications of the officers of the future should be such as would be acceptable to those framing international conventions, especially in regard to the soundness of animals, their transport and for trade in livestock and livestock products. Furthermore, it was admitted that adequate provision was necessary for teaching up to the highest standards of veterinary science, suitable to equip young Indians for direct recruitment to the superior provincial services, which had been created to take the place of I. V. S., consequential on the Lee Commission recommendations. Such provision is urgently needed for exploiting the potential wealth of the country for the benefit of India's peasantry. Recently, the opinions of the provincial Governments and Directors of Veterinary Services were obtained on the matter and it appeared to be generally accepted that the present courses of instruction at the different veterinary colleges in India are suitable only for the training of veterinary assistant surgeons meant to hold appointments in the subordinate grades of the provincial veterinary services. Furthermore it has been stated elsewhere that "graduates of the Bombay, Calcutta and other colleges are not suitable for appointment as veterinary assistant surgeons in the Indian Army Veterinary Corps and that Madras and Lahore only can at present furnish suitable veterinary assistant surgeons".

FAILURE OF PREVIOUS ATTEMPTS.

Previous attempts to place veterinary education on a better footing in India failed mainly on account of the paucity of funds available for the purpose both with the Central and Provincial Governments. Under these circumstances, the only possible alternative was to attempt to secure a better class of student by raising the minimum educational qualifications necessary for admission, into all Indian veterinary colleges, to the F. Sc. (Medical Group) of the Punjab University or its equivalent, which roughly corresponds to the entrance examination at the veterinary colleges in the United Kingdom. It was hoped eventually to provide at one selected college, a course of additional training of 2 or 3 years' duration, which would enable the best of the students from the existing 3 or 4 years' course to be trained upto the full M. R. C. V. S. standard.

With this object in view an endeavour was made to arrange for the curricula at all the existing colleges, to be modelled on a uniform curriculum, given in Appendix A, which was drawn up by a special Committee and issued to all provinces after it had been fully discussed and accepted by the Animal Husbandry Wing of the Board of Agriculture in 1933.

This attempt has had little effect. Principles of the Indian Veterinary Colleges state that in view of the present low scales of pay which are offered to their graduates they are unable to demand the F. Sc. standard of education for admission to their 3 years' courses. Nowhere except at the Punjab Veterinary College is the Intermediate standard now insisted on, nor at any college is the course organised in 5 groups as was recommended. In fact, the time has come when it must be recognised that (1) the provinces are quite unable to pay their subordinate veterinary services at rates calculated to attract well-educated Indian young men (F. Sc. standard) to undertake 5-year courses of veterinary instruction, and that (2) there is little likelihood of any material change in the present curricula obtaining at the Indian veterinary colleges which would bring their courses of professional training upto the M. R. C. V. S. standard. As pointed out before, these courses were established for the training of veterinary assistant surgeons, and though it is natural that graduates should wish to obtain recognition as fully qualified "veterinary surgeons", it is quite certain that the Royal College of Veterinary Surgeons will refuse this, until (a) at least equal standards of education and courses of professional training of equal duration are insisted on;

(b) the qualifications of the instructors at the college or colleges which train upto the standard is the M. R. C. V. S. or higher and until.

(c) provision is made for the examinations to be conducted by a competent Board of Examiners approved by them or over whose examinations they are able to exercise satisfactory control.

Whether provision be made to carry this out in India, or not, it must be recognised that veterinary services comprising a due proportion of fully qualified veterinary surgeons will in any case be essential in order to ensure a level of efficiency which would be acceptable for purposes of international conventions in the matter of disease control and trade in livestock and livestock products.

NEED FOR A CENTRAL VETERINARY COLLEGE.

The supply of young Indians who have obtained the M. R. C. V. S. Diploma in the United Kingdom in recent years appears likely to cease altogether, since during the last 2 years no young Indian has joined a veterinary college in the United Kingdom. If reasonable provision is to be made for veterinary education, disease control and research on animal husbandry matters in India, it will thus be necessary, in any case, to start a fully equipped and properly staffed Central Veterinary College, somewhere in India. But, in consequence of the difficulty which provinces find in offering suitable remuneration to fully qualified veterinary surgeons, the number required annually would probably not at present exceed 10, though in view of the huge economic importance of livestock to India, provision for a large number ought undoubtedly to be made. It must, at the very outset, be understood that to attain a standard which would be recognised by the Royal College of Veterinary Surgeons, or any other similar body, it will be necessary, for at least a few years

to come, to employ experienced teachers from the United Kingdom with the M. R. C. V. S. or higher qualification and to arrange for examiners to be sent out each year to ensure that the standards of training and examinations in this country are equal to those of the international standards which are now insisted upon in all progressive livestock countries.

GENERAL PROPOSALS.

The proposals briefly are:—

(1) The five existing veterinary colleges should continue to train veterinary assistant surgeons for the provincial subordinate departments. They should, however, be given the opportunity of taking advantage of the facilities for higher training offered by the Central College by sending selected students to that College at the end of the first two years at a provincial college.

(2) With this object the curriculum given in Appendix B has been drawn up with a view to its adoption in those provincial colleges which desire to apply for recognition of their course as suitable preliminary training for the higher course. It will be observed that in this course, instruction in elementary chemistry and biology is included, which was not the case in the curriculum drawn up and approved by the Animal Husbandry Wing of the Board of Agriculture (Appendix A). The reason for this is that provincial colleges find it difficult, on the score of the prospects offered after graduation, to recruit F. Sc. (Medical Group) students as originally recommended by the Board of Agriculture, and have to accept matriculates or less for whom provision for training in these basic subject is necessary, in the first year, in order to enable them to understand their training in subsequent years.

(3) At the same time it will be necessary for those provincial colleges desiring recognition to raise the standards of their teaching staffs and examinations to those of the Central College in the first two years of the course.

(4) Though matriculates may be accepted for the 3-year provincial course of instruction, nothing below F. Sc. (Medical Group) of the Punjab University or its equivalent should be accepted for higher course of training, whether the first two years are taken at a provincial or the Central College. If a sufficient number of applications are received from provincial colleges, the admissions into the 3rd year at the Central College should be on a 50: 50 basis, as far as possible.

(5) The course of instruction at the Central Veterinary College should be of 5 years' duration and the syllabus of courses should be practically the same, with minor alterations and additions to suit Indian conditions, as for the 5 years M. R. C. V. S. Diploma course in the United Kingdom (Appendix C).

(6) If recognition by the Royal College of Veterinary Surgeons of the Diploma awarded by the Government of India is desired, it will be necessary to arrange for a delegation from that body to satisfy themselves that the training imparted and the examinations conducted at the Central Veterinary College are of a satisfactory standard.

THE CENTRAL VETERINARY COLLEGE.

In order to make provision for advanced training in the art and science of veterinary medicine and surgery as well as in animal husbandry, it will be necessary either to take over one of the five existing provincial veterinary colleges or to build a new one, and it is considered that the latter course should be adopted. The establishment of a new Central Veterinary College would inevitably involve considerable expenditure, but it has to be recognised that unless satisfactory provision is made for the regular supply of highly qualified veterinary surgeons trained in this country, India is likely to remain indefinitely in a position of inferiority as to veterinary education, and unable to take her place with other nations in such matters as disease control, and development of her trade in livestock and livestock products.

Assuming that the establishment of a new veterinary college under the Government of India is agreed to, the question of the most suitable place to locate the proposed institution has been carefully considered and Izatnagar has been selected for the following reasons :—

- (1) Izatnagar is fairly centrally situated and is as near to the Headquarters of the Government of India as it is desirable for research and training institutions of this kind to be.
- (2) The inherent difficulties of dual control will be avoided.
- (3) Government land for buildings is available in addition to other facilities for training.
- (4) The close proximity of Izatnagar to Muktesar would provide both the teachers and students of the College with a high-type of research atmosphere and easy access to India's premier veterinary library—conditions that are not available elsewhere in the country.
- (5) A large research organisation at Izatnagar is now in the course of completion. This will eventually include the following sections: Biological Products Section, Animal Genetics Section, a herd of dairy cattle, a Nutrition Research Section, and a Poultry Research Section. With these facilities the students at the College will be in an exceptionally good position to receive the practical instruction in research methods and in all the subjects pertaining to their profession which is so essential; and when necessary, special short courses of lectures in particular subjects could be conveniently arranged from members of the research staff at Izatnagar or Muktesar. The educational and research atmospheres will be very happily combined.

In order to provide clinical hospital practice for the students, the co-operation of the Director of Veterinary Services, United Provinces would be required to arrange for a veterinary hospital to be opened in Bareilly City and run in conjunction with the proposed College.

CURRICULUM FOR THE CENTRAL COLLEGE.

At the Central College it is proposed to have the following five separate teaching sections and it will be desirable for those provincial colleges who intend to apply for recognition to adopt the same arrangement :—

1. Anatomy and Surgery.
2. Histology, Physiology and Hygiene.
3. Biology, Microbiology and Pathology.
4. Pharmacology and Medicine.
5. Animal Husbandry and Preventive Medicine.

NOTE.—Full courses of Chemistry and Biology are not included in the course as entrants to the College (being at least F. Sc. Medical Group of the Punjab University or its equivalent) would have the requisite elementary training but it is proposed that a certain amount of instruction be given in these subjects, with particular reference to their application in veterinary science. For this an outside teacher might be required in the case of Chemistry and could probably be obtained from the staff of the Science College, Bareilly.

Each of the 5 main Sections would be in the charge of a senior Professor whose minimum qualifications should be the M. R. C. V. S. Diploma with considerable teaching experience in a veterinary college. Professorial grade of pay at this College should be a selection grade of Rs. 1,250–50–1,500 plus an Overseas Pay of £30 p.m. for officers of non-Asiatic domicile and a special pay of Rs. 250 p.m. for the Principal. In addition, a Class I officer as Assistant Professor will be required in each of the Anatomy and Pathology Sections. For these posts, at any rate from the start, men with experience would have to be recruited from abroad.

PROBABLE EXPENDITURE.

It is intended that from 10 to 12 fully qualified veterinarians shall be turned out each year and this would mean providing laboratory accommodation, hostel,

etc., for about 70 students. An estimate of the initial and recurring cost of running such an institution is submitted below :—

ESTIMATE OF CAPITAL EXPENDITURE.

P. W. D. Works Budget.

	Rs.
(i) Main Building, including Principal's office, his retiring room, Assembly Room, Library, Store-rooms, Museums, Staff room, Lavatory (10,000 sq. ft. plinth area at Rs. 5 per sq. ft.—Architectural design)	50,000
(ii) 5 Teaching Blocks, each having students' Laboratory, Professor's office, his retiring room, sectional museum and store, lecture theatre, rooms for Assistants and Lecturers, etc. (with a plinth area of each 7,000 sq. ft.) at Rs. 5 per sq. ft.—Architectural design	1,75,000
(iii) Hostel for 70 students, each student having a room (12' x 12') and a separate bath (10' x 8')—with kitchens, common rooms, dining halls. Total plinth area 25,000 sq. ft. at Rs. 5 per sq. ft.—Architectural design	1,25,000
(iv) 5 Class I Bungalows for Professors at Rs. 20,000 each	1,00,000
(v) 2 Class II Bungalows for Assistant Professors at Rs. 14,000 each	28,000
(vi) 5 Quarters for subordinate service staff at Rs. 3,500 each	17,500
(vii) 10 Quarters for clerks and laboratory assistants at Rs. 3,000 each	30,000
(viii) College inferior staff quarters for 20 at Rs. 650	13,000
(ix) Menials' quarters for 10 at Rs. 600	6,000
(x) Hospital at Bareilly—10,000 sq. ft. Plinth area at Rs. 3-8-0 per sq. ft.	35,000
(xi) Hospital Surgeon's quarter	3,500
(xii) Hospital inferior staff quarters for 4 at Rs. 650	2,600
(xiii) Hospital menials' quarters for 6 at Rs. 600	3,600
(xiv) Water supply (Distribution)	10,000
(xv) Electric Wiring (Distribution)	20,000
(xvi) Levelling and roads	10,000
(xvii) Playgrounds and gymnasium	10,000
(xviii) Sanitation of the Estate	80,000
Total	7,19,200

Departmental Budget.

(i) Equipments for class-rooms, laboratories, offices, etc.	75,000
(ii) Purchase of books for library	3,000
(iii) Gas Supply	10,000
Total	8,07,200
10 per cent. Contingencies and unforeseen items	80,720
GRAND TOTAL	8,87,920

Recurring Expenditure.Establishment—*

	Rs.
1 Principal, Pay Rs. 1,250—50—1,500 <i>plus</i> £30 <i>plus</i> Rs. 250 Special Pay	25,392
4 Professors, Pay Rs. 1,250—50—1,500 <i>plus</i> £30	89,568
2 Class I Assistant Professors, Pay Rs. 275—300—325—25—650—(E. B.)—35—1,000	15,168
Allowance for Hostel Superintendent	1,200
5 Technical Assistants, Pay Rs. 100—5—150 (E. B.)—5—200	9,206
1 Head Clerk, Pay Rs. 85—4—125	1,368
1 Accountant, Pay Rs. 85—4—125.	1,368
3 Clerks, Pay Rs. 45—2—85	2,391
5 Laboratory Assistants, Pay Rs. 35—2—85	3,480
24 Inferior staff, Pay Average Grade Rs. 15—1—25	6,336
16 Menials at Rs. 12 per mensem	2,304
1 Hospital Surgeon, Pay Rs. 200—8—280	3,100

Other Recurring Expenditure.

Hospital Requisites and Apparatus	25,000
Travelling allowances	5,000
Gas	5,000
Electricity	7,500
Books and Periodicals	500
Postage and Telegrams	400
Office Contingencies	5,000

Total 2,09,281

or say 2,10,000

* Excluding Outside Teachers' and Examiners' fees.

APPENDIX 'A.'

Proposed Curriculum for Indian Veterinary Colleges by the First Animal Husbandry Wing Meeting.

Year	Group I	Group II	Group III	Group IV	Group V
1	Embryology. Anatomy.	Stable Management.	Physiological Chemistry. Physiology.	Pharmacy.	Protozoology. Helminthology. Entomology.
2	Regional Anatomy. Shooring.	Housing and Sanitation. Genetics. Dietetics.	Histology. Pathology.	Materia Medica. Pharmacology.	Bacteriology. Mycology. Filtrable Viruses.
3	Surgery and Obstetrics.	Dairy Science.	Meat Inspection.	Therapeutics. Clinical Medicine.	Immunology. Preventive Medicine.

APPENDIX 'B.'

Proposed Curriculum for Provincial Veterinary Colleges.

Year	Group I	Group II	Group III	Group IV	Group V
1	Physics, Chemistry & Biology. Anatomy (Osteology).	Stable Management.	Physiology.	Pharmacy.	Protozoology. Helminthology. Entomology.
2	Regional Anatomy. Shoeing.	Housing & Sanitation (Hygiene) & Dietetics. Animal Breeding.	Histology. Pathology.	Materia Medica. Pharmacology.	Bacteriology. Mycology. Filtrable Viruses.
3	Surgery. Obstetrics.	Dairy Practice & Milk Hygiene.	Meat Inspection.	Therapeutics & Clinical medicine.	Immunology. Preventive medicine.

Proposed Curriculum for the Central Veterinary College.

Anatomy and Surgery.	Histology, Physiology and Hygiene.	Biology, Microbiology, Pathology.	Pharmacology and Medicine.	Animal Husbandry and Preventive Medicine.
I. Osteology	Histology and Embryology	Biology	Chemistry and Physics .	Animal Management I.
II. Regional Anatomy and Shoeing.	Physiology including Physiological Chemistry.	Protozoology, Entomology, Helminthology.	Pharmacy	Animal Management II.
III. Anatomy of domesticated animals.	Animal Nutrition . . .	Bacteriology, Mycology, Filtrable viruses.	Materia Medica and Pharmacology.	Agricultural and Dairy Practice.
IV. Surgery I	Animal Genetics . . .	Pathology	Therapeutics and Toxicology.	Immunology.
V. Surgery II including Obstetrics and jurisprudence.	Veterinary Hygiene . .	Meat and milk inspection	Clinical medicine . .	Preventive Medicine.

APPENDIX II.

NOTE ON SUBJECT No. 2—BY MR. W. TAYLOR, I.V.S.

The Agricultural Commission of 1927 recommended a very large increase in the personnel of the Veterinary Departments chiefly with a view to further concentration and extension of Animal Husbandry activities throughout India. It was suggested that, as far as is possible, the zamindar should not normally have to proceed for more than five miles in order to obtain veterinary attention for his cattle. The broad meaning of this was that there should be a veterinary hospital at intervals of ten miles, always, of course, keeping in view the density of the cattle population. In all provinces this procedure would mean a very vast increase of qualified men, and it is clear to all that no provincial Government could pay the monthly charges for so large a number of veterinary assistants as would be necessary.

It would, therefore, be apparent that if animal husbandry activities are to be very considerably increased a cheaper man than the veterinary assistant will have to be found to carry out certain duties, necessary for this expansion.

From an economic point of view only, the activities of the veterinary department which are of the most value to the various provincial Governments, are those in connection with the improvement of the quality of cattle, and prevention or control of outbreaks of epidemic diseases.

(i) With regard to the present condition of cattle breeding it must be common knowledge that there are not sufficient bulls of the right quality available for cattle improvement, although as a stopgap there may be a considerable number of approved bulls, which can be utilised until such time as good pedigree bulls are available. Assuming this to be true, the greatest effort has to be made to prevent unapproved bulls from covering the cows, and there is only one method to prevent this, *viz.*, by means of castration of the unsuitable bulls.

Without castration of the vast numbers of unsuitable bulls, cattle improvement will make very little headway.

(ii) The control of epidemic disease is to a large extent a matter of "bandobast" for biological products exist for the effective checking of these outbreaks, if they are utilised without delay. Sometimes in a large outbreak involving many thousands of animals, delay in quick inoculation is of very great economic importance. Very often time is lost because there are not sufficient men available to carry out efficiently and quickly the necessary inoculations.

On account of the inability of the Provincial Governments to pay a sufficient number of qualified men to cope effectually with epidemics, the necessity of employing a cheaper man than the veterinary assistant for this work will be obvious.

The present position in most Veterinary Hospitals is that there is a veterinary assistant, aided by a compounder to carry out professional activities. The veterinary assistant is expected to tour in his "ilaga" for a certain period of each month, say ten days, during which time he performs castrations and may possibly do a little professional work in addition, in outlying areas. During this time the compounder is left to look after the outpatients, and inpatients, if any, in the local hospital. The compounder's knowledge of compounding is such as he has been taught by the veterinary assistant and may or may not be adequate for him to be able to carry on as a "locum". His knowledge of sporadic diseases is nil, but he may be able to dress a wound. The local District Board, therefore, is left for a third of each month with a hospital, for the construction of which they have spent about Rs. 8,000 in charge of a man whose qualifications amount to almost nil, and the local cattle and horse owners are compelled to put up with it.

When there is an outbreak of contagious disease in the neighbourhood, the position in the local hospital is aggravated to a greater extent.

Reverting to the question of castration of unsuitable bulls, there is no doubt that some twenty years ago it was highly desirable that this operation should be performed by properly qualified men, indeed it was a necessity.

However, since the appearance of several patterns of mechanical castrators, which do not necessitate the cutting of the skin nor letting of blood, the necessity for the highly qualified men does not arise, as these operations can now be carried out

by men of very much less training, provided of course that they have received an adequate training in this work, and instructions regarding the anatomy of the part and work under veterinary supervision.

In connection with the second major activity of inoculations at the time of outbreaks of epidemic disease, a similar condition prevails.

It is understood that the officer incharge of inoculations during an outbreak must be one with veterinary qualifications. This is essential, otherwise a great deal of grief may result. There is not, however, any necessity for the bulk of the men, performing the actual operation, to be of equal qualification. It is true that they will need training in all the various methods of inoculation, but that would not require any considerable time. Provided there is adequate veterinary supervision, these men of short training could cope with the outbreaks, and as effectively as at present, for it must be borne in mind that provided the arrangements for dealing with an outbreak are adequate, the checking of an epidemic depends upon the potency of the biological product from Muktesar and not on the qualifications of the man at the other end of the syringe.

Moreover, on account of the lower cost of these men, it will probably be possible, in places where the necessity arises, in tracts where epidemics are common, and in cattle breeding tracts, to employ them in larger numbers.

It may be argued, and quite rightly, that castrations *plus* attending to spasmodic outbreaks will not constitute sufficient work for a whole time man.

These men will primarily be used for Animal Husbandry work, and these activities can with profit be augmented by putting them in charge of branding (or marking) pedigree stock, and also registration of such stock, although it is not suggested for a moment that these men should be entirely responsible for the registration, etc., of pedigree or approved animals, but they would be used to supplement the work of local or veterinary officers employed in those duties.

The best of them may also be used for propaganda work.

For the great bulk of them it is proposed that in addition to being trained in castration and inoculation, they should receive a course of training in compounding and dressing. If they have this, they could be used for the purpose of visiting outlying dispensaries and the treatment of simple cases.

These activities could possibly be co-ordinated with the visits in the "ilaqa" for the purpose of castration.

It will probably be asked what the Veterinary Assistant will be doing while the compounder is on tour for any of the above mentioned various reasons. The Veterinary Assistant will be doing his own compounding. At College he passes through a very thorough course of Pharmacology, Materia Medica and Pharmacy and is well able to carry out these duties.

It is true that in some of the larger hospitals the compounder cannot be spared for above-mentioned field duties, and in these cases it is suggested that there should be a second trained man stationed in them, for it is clear that if the hospital is so busy that the compounder cannot be spared, then it is equally obvious that the Veterinary Assistant cannot be absent.

It is probable that an able veterinary assistant in a hospital is the best advertisement that the veterinary department possesses.

The eagerness manifested by some District Boards in offering to build hospitals demonstrates a desire for veterinary aid in their villages, and it is doubtful if, after going to that expense, it is just to deprive them for a large part of the month of the services of their veterinary assistant, when it is not necessary to do so.

On account of the foregoing reason it is therefore proposed that these compounders (stockmen) should undergo a three (four) months' training at the various veterinary colleges.

This would provide ample time for them to undergo a training in compounding better than they at present receive, and dressing, with the treatment of simple cases, castration and inoculations. Other activities such as the registration of stock, marking or branding, etc., would be taught to them later by their field officers.

It will be appreciated that this scheme will not cause any extra expenditure, or very little more, than at present.

The only possible extra expenditure would be in the case of those hospitals which have a large daily attendance of cases and from which the usual compounder cannot be spared. In these few instances it would be necessary to employ an extra man.

The supervision of these men would be carried out as at present in the hospital, and when in the field either castrating, inoculating, or registering of stock, their work would be checked by the various field officers in the same way that the work of assistants in the field is now checked.

The type of man who would be suitable for the above-mentioned activities, would be a matriculate, who can probably be obtained for about Rs. 25—30 per mensem.

There would be a slight individual saving, which at the end of the year may amount to a considerable provincial saving in that the travelling allowance, etc., drawn by these men would be less than that now drawn by veterinary assistants.

It is fully appreciated that the above suggestions may not suit all provinces or states equally, on account of variations in personnel and methods of working, but they are put forward in order to stimulate discussion on the subject, and to formulate a better solution. Some such solution will have to be found, if a considerable stimulus is to be given to Animal Husbandry development.

APPENDIX III.

NOTE ON SUBJECT NO. 3, BY MR. K. P. R. KARTHA.

Animal Husbandry Bureau, Imperial Council of Agricultural Research.

In order that the Animal Husbandry Bureau may function efficiently as a clearing house for information and be of real service to those interested in the subject it is necessary that the material that exists should be available in a form which facilitates co-ordination and which presents no doubt or difficulties as regards interpretation. The Annual reports of Directors of Veterinary Services being one of the most important sources of information on animal husbandry matters available in this country uniformity in the presentation of material therein is essential. The object of this note is to offer suggestions for achieving this uniformity by a re-arrangement of and minor alterations in the tables at present attached to the reports.

The following statement shows the contents of existing tables.

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Statement showing contents of existing tables in the Annual Reports of Civil.

Name of Province.	Table I	Table II	Table III	Table IV	Table V	Table VI	Table VII
Madras . .	Mortality from contagious diseases.	Results of Preventive inoculation.	Number treated and castrated by V. A. S.'s on tour.	Number treated and castrated in hospitals.	—	—	—
Bombay (including College and Harbour.)	Do. .	Do. .	Do. .	Do. .	Expenditure on Civil Veterinary Dept.	Results of professional examinations.	Strength of different classes of college.
Sind . .	Do. .	Do. .	Do. .	Do. .	Do. .	Horse and Pony stations under local bodies.	Services of horse and pony stallions.
Bengal . .	—	Mortality from contagious diseases.	Results of preventive inoculation.	Number treated and castrated by V.A.S. on tour.	Number treated and castrated in hospitals.	—	How V. A. S.'s are employed and from where paid.
Punjab . .	Results of Veterinary college.	Do. .	—	Do. .	Do. .	—	Bulls at stud.
United Provinces.	—	Do. .	Results of preventive inoculation.	Do. .	Do. .	Strength of subordinate establishment.	Horse and donkey stallions at stud.
Central Provinces.	Special State-ment.	Cancelled .	Do. .	Do. .	Do. .	—	Strength of subordinate staff.
Bihar and Orissa.	Results of Veterinary college.	Mortality from contagious diseases.	Do. .	Do. .	Do. . V (a) treated in Veterinary Hospitals.	—	Do. VII (a) College.
Assam . .	—	Do. .	Do. .	Do. .	Do. .	—	Do. .
N. W. F. P. .	—	Do. .	Do. .	Do. .	Do. .	—	Do. .
Hyderabad .	Results of Veterinary students studying outside.	Do. .	Do. .	Do. .	Do. .	Horse and pony stations at stud.	Service Record of Horse and pony stallions.

N.B.—Dash (—) indicates

Veterinary Departments (extracted from Reports for 1934-35).

Table VIII	Table IX	Table X	Table XI	Table XII	Table XIII	Table XIV	Table XV
Strength of different classes of college arranged according to community.	Financial statement of veterinary college.	Results of Veterinary College and schools.	Financial statement of City and Harbour Veterinary Department.	Financial statement of Veterinary Investigation Officer.	—	—	—
Horse Fairs and shows.							
Distribution of stud bulls.	—	—	—	—	Horse Fairs and shows.	Cattle Fairs and shows.	
Horse and donkey stallions at stud.	Cattle fairs and shows.	Cost of Civil Veterinary Department.	Expenditure by local bodies.	—	Breeding results of Hissar.	Working of Hissar Cattle Farm.	
Services of horse and donkey stallions.	—	—	—	—	—	Cost of Civil Veterinary Department.	
Number of bulls at stud.	—	—	—	—	—	Cattle fairs and shows.	
Do.	Results of working of cattle farm.	Horses, ponies and stallions at stud.	Services of Horses, Ponies and stallions.	Cost of feed-keep, attendance, etc.	—	Cattle fairs and shows.	XIV-A. Cost of C. V. D.
Do.	—	—	—	—	—	Do.	Cost of C. V. D.
VIII a number of cows covered.	—	Do.	Do.	—	Do.	Do.	Do.
Number of bulls at stud.	Cost of maintenance of stallions.	Horse and cattle fairs.	Strength of Veterinary staff.	Cost of Civil Veterinary Department.	Herd strength at Hingoli stud farm.	Working results of Hingoli stud farm.	Touring results.

the tables are blank or absent.

It will be seen that though many of the tables are common there are some blanks and they are not presented in the same order. There are also variations in the contents of individual tables as presented by different provinces. The suggestions below aim at presenting the tables as far as possible in the same serial order with identical headings and other details of form.

The tables may be divided into three classes, viz.—

- (a) Tables like mortality, inoculations, castrations, etc., which are very important and the contents of which are required for several purposes.
- (b) Those which are of purely administrative interest or those which are not of all-India importance.
- (c) Special statements arising out of special experiments or investigations conducted which are not a normal feature of the reports and which are not common in all the provinces.

It is proposed that (a) should appear first in the same serial order with identical details; tables of the kind described in (b) should appear next, and (c) should be presented separately under the heading "Appendices." The following are specimens of the various tables with explanations.

TABLE I

Statistics of mortality from contagious diseases and other causes among livestock in the Province/State of during

This table was considered at an informal meeting of the Directors of Veterinary Services held at Simla in July 1935 and the revision recommended by them was accepted by the Government of India and circulated to all Provincial Governments. The meeting did not recommend the provision of a column for deaths from 'other causes' like snake bite, old age, etc., because it was thought that accurate statistics are not likely to be available. Since certain provinces appeared to have figures it was later decided to insert a column for other causes. Those Provinces which do not have figures will leave the column blank, and those which have figures will state in a footnote how far the reporting is correct. In the specimen table appended to this note the following alterations have been made:

- (a) A slight alteration in the heading in order to improve its wording.
- (b) Two columns for grand total at the right end of the table.
- (c) Two lines at the bottom for statistics for the previous two years.
- (d) All columns are serially numbered to facilitate reference.

TABLE II

Summary of Results of Preventive inoculation in the Province/State of during

This table too has already been revised in the light of the I. C. A. R.'s practical use of it and the revised form sent to all Provinces. In the specimen attached herewith an example is given to show how it should be filled up. It is necessary for statistical analysis that figures should be available separately for each method of treatment and for each source of product. Thus for any disease if a province adopts two methods of inoculation M_1 and M_2 and the products from three institutes S_1 , S_2 and S_3 are employed for one, and products from two institutes S_1 and S_2 for the second method the statistics may with advantage be furnished as exemplified in the attached specimen. In M_1 there will be three totals, one for each of S_1 , S_2 and S_3 and also a grand total for all the three sources. Similarly there will be a total for each of S_1 and S_2 used in the second method, a total for the two and finally a grand total for all the five. This would give all the information necessary for a proper interpretation. In a province with inoculation operations spread out over a large number of districts much space will be occupied by this table but it would furnish some essential information which it would be difficult to extract after the report is prepared.

When the statement is furnished in this form there is no necessity for sending a separate return to the I. C. A. R. showing results of inoculation with Muktesar products.

TABLE III

Statement showing the number of animals treated and castrated by Veterinary Assistant Surgeons on tour during

A specimen is attached. No alteration is proposed.

TABLE IV

Statement showing the number of animals treated and castrated at Veterinary Hospitals and Dispensaries during

A specimen is attached. No alteration is proposed.

TABLE V

Statistics of castrations and treatments performed in the Province/State of..... during

This table is not a feature of existing reports, but is highly necessary for various purposes. It consists of three parts: cases treated during the year, number of castrations performed and the livestock population. The first two items have to be compiled from tables III and IV (adding up corresponding figures in the two) and the third from the livestock Census. The advantage of having the table is that it would furnish at a glance an idea of the extent of activities of the Department regarding castrations and treatments compared to the livestock population in the various districts and Provinces. Since livestock Census is taken only once in five years the same figures would appear in the third part of the table for five years. This would make the interpretation from this table a bit unreal, but it cannot be helped under the present circumstances. The error would not, however, be serious as the fluctuations in the population are not large.

TABLE VI-A

Statement showing numbers of approved bulls at stud in the Province/State of during

TABLE VI-B

Statement showing numbers of approved male buffaloes at stud in the Province/State of during

TABLE VI-C

Statement showing numbers of approved donkey and horse stallions at stud in the Province/State of during

These tables though present in the reports of certain provinces are not common in all. In those provinces, where breeding operations are under the control of Agricultural Departments the return of stud bulls is not a necessary part of the reports of Veterinary Departments. As the details proposed in the attached tables are, however, very often required along with cognate information contained in the reports of Veterinary Departments, it is believed there would be no objection to obtaining the necessary information from the Directors of Agriculture and incorporating it in the Veterinary Department reports. The reports of the Directors of Agriculture do not contain the details in the classified form suggested in this note.

Statement showing particulars of cattle fairs and shows held in the Province/State of during

A specimen form is attached.

TABLES VIII, IX AND X.

Three more tables that may be attached are:—

1. Cost of Civil Veterinary Departments analysed under various heads.
2. Strength of staff employed and how they are distributed.
3. Results of collages.

As details may vary no specimens are given.

II

There are, in certain reports, statements showing the working results of certain Farms, etc. These cannot be common to all provinces. Such special statements may be given numbers from XI onwards. Results of special experiments or investigations conducted may be added under the title Appendices.

III

The statistics of livestock slaughtered in recognised slaughter houses are not at present available in all the Provinces. Most of the Provinces have, however, promised to obtain these statistics and furnish them to the I. C. of A. R. and some have already supplied these figures for last year. A standard form for this return is prepared and attached to this note. Since meat inspection is one of the functions of Veterinary Departments the Board may consider whether these slaughterhouse statistics should form a common feature of the annual reports of the Directors of Veterinary Services.

[illegible]

* Give figures for two previous years.
N.B.—State approximately how far statistics of mortality from 'Other causes' have been correctly reported.

Statement showing the number of animals treated and castrated at the Veterinary Hospitals and Dispensaries during the year

District.	Number of Veterin- ary Institutions.	Number of Veterin- ary Assistant Sur- geons employed.	Number of in-patients treated during the year.				Number of out-patients treated in the year.				Grand Total of In and out-patients treated during the year.	Total number of cases supplied with medicine but not brought to institu- tions.	'Castrations performed.'				Receipts.	Expenditure.	
			Bovines.	Equines.	Others.	Total.	Bovines.	Equines.	Others.	Total.			Bovines.	Equines.	Others.	Total.			
1.
2.
3.
4.
etc.
etc.
Total.
Total in
Total in
			} Total for the previous two years.																

TABLE IV

District.	Number of Veterinary Assistant Surgeons employed.	Castrations performed.	Treated for contagious diseases.	Treated for non-contagious diseases.	Total number of castrations performed and cases treated.
		Bovines. Equines. Others. Total.	Bovines. Equines. Others. Total.	Bovines. Equines. Others. Total.	
1.
2.
3.
etc.
Total
Total in
Total in
		{ Total in previous two years.			

TABLE V.

Statistics of Castrations and treatments performed in the Province/State of

during

Name of District.	Number of animals treated.			Numbers of animals castrated.			Live stock Population.				Remarks.	
	Bovines.	Equines.	Others.	Bovines.	Equines.	Others.	Bovines.		Equines.			
							Males.	Females.	Males.	Females.		
Total	
Total for	
Total for	} Previous two years.			..	..	..	..	..

TABLE VI-A.

Statement showing the numbers of approved bulls at stud in the Province/State of

during

Name of District.	Number of approved bulls at stud.										Number of cows covered during the year.	
	Present on 1st April.	Obtained during the year.		Casualties during the year.		Balance in hand on 31st March.		Net cost for the year for the lease and maintenance of stud bulls.		Population of cows over 3 years according to census.		Required to be maintained at one per hundred cows.	Short of requirements.
	Property of Government.	Property of local bodies.	Government.	Local bodies.	Average price paid per head.	Government.	Local bodies.	Government.	Local bodies.	Total.		
1												
2												
3												
etc.												
Total.												
Total for
Total for	} Previous two years.			..	..	..	..	..	..	..

TABLE VI-B.

TABLE VI-B.
Statement showing the numbers of approved male buffaloes at stud in the Province¹ State of

[illegible]

TABLE VI.C.
Statement showing numbers of approved Horse and Donkey Stallions at stud in the Province/State of during

[illegible]

TABLE VII.

Abstract of Particulars regarding Cattle Fairs and Shows held during the year in the Province of

Name of District.	Number of cattle fairs and shows held.	Total Number of Stock present.						Average price of Animals sold.				Total number of animals that competed for prizes.	Price Money provided.				Number of Medals awarded.			
		Bulls.	Bullocks.	Cows.	Young stock.	Bulaloes.	Camels.	Others.	Bulls.	Bullocks.	Cows.		Bulaloes.	Camels.	Amount realized in fees.	From Provincial funds.		From local funds.	From other sources.	Total.	Amount actually awarded.
1.
2.
3.
etc., etc.
Total
Total in
Total in
Totals for the two previous years.																				

Totals for the two previous years.

TABLE VIII.

Statistics of livestock slaughtered in recognised slaughter houses in the Province/State of during

Statistics of livestock slaughtered in recognised slaughter houses in the Province/State.																								
Name of District.		Number of recognised slaughter houses for										Number of animals slaughtered.										Slaughter fee per head.		
		Cattle and buffaloes.		Sheep and Goats.		Pigs.		Others.		Govt.	Local bodies.	Govt.	Local bodies.	Govt.	Local bodies.	Govt.	Local bodies.	Govt.	Local bodies.	Govt.	Local bodies.	Govt.	Local bodies.	
		Govt.	Local bodies.	Govt.	Local bodies.	Govt.	Local bodies.	Govt.	Local bodies.															Govt.
1.
2.
3.
4.
etc.
Total
Total for
Total for

Total for two previous years.

From a study of the cattle mortality from Haemorrhagic Septicaemia in Madras Presidency during the past 38 years from 1898-99 to 1935-36—*vide* Statement No. 1, it is seen that except in a few years, there is no marked difference in yearly mortality and that the disease does not assume a periodical intensity in the form of a regular wave as is observed in the case of Rinderpest in this Presidency. The average mortality for the Presidency comes to about six thousand per year.

Ganjam	about 765 i.e.	0.5	for every 10,000 of cattle population.	} For 10 years' figures — vide Statement No. II.
Chingleput	"	881	11.1 Ditto.	
Kistna	"	513	5.8 Ditto.	
Tanjore	"	537	5.3 Ditto.	
Guntur	"	541	4.5 Ditto.	
Nellore	"	668	6.0 Ditto.	
Vizagapatam	"	518	3.0 Ditto.	

4. A study of particulars of over 1,000 outbreaks of Haemorrhagic Septicaemia in six badly infected districts during a period of 10 years shows that an outbreak of Haemorrhagic Septicaemia is not usually a protracted one. In the 260 outbreaks in which inoculations with serum alone were done (54,000 inoculations with 24 deaths among the inoculated), only in three outbreaks, reinoculation was found necessary.

6. From these facts, it appears to be clear that an outbreak of Haemorrhagic Septicaemia can be satisfactorily controlled by the timely use of anti-serum and that vaccine or sero-vaccine method is neither indicated nor necessary for the control of outbreaks of this disease in this Presidency.

FIGURES SHOWING THE MORTALITY IN THE MADRAS PRESIDENCY DUE TO HAEMORRHAGIC SEPTICAEMIA FOR 38 YEARS FROM THE YEAR 1898-99 TO 1935-36.

[illegible]

[illegible]

STATEMENT NO. II.

ANNUAL MORTALITY FROM HAEMORRHAGIC SEPTICAEMIA FOR 10 YEARS FROM 1926-27 TO 1935-36 IN DISTRICTS WHICH RECORDED OVER 500 ON AN AVERAGE.

Year.	Ganjam.	Vizaga- patam.	Kistna.	Guntur.	Nellore.	Chingle- put.	Tanjore.
1920-27 . . .	1,103	770	820	708	683	583	565
1927-28 . . .	1,848	518	337	318	304	430	627
1928-29 . . .	850	654	308	372	185	566	826
1929-30 . . .	1,334	540	451	339	431	1,737	511
1930-31 . . .	797	227	362	454	844	2,055	195
1931-32 . . .	954	430	292	381	750	942	157
1932-33 . . .	317	05	067	648	622	630	809
1933-34 . . .	303	864	953	804	689	654	532
1934-35 . . .	380	530	522	786	1,309	637	592
1935-36 . . .	117	508	409	519	855	497	550
Total for 10 years .	7,650	5,184	5,126	5,414	6,681	8,807	5,373
Yearly average .	765	518	513	541	668	881	537

STATEMENT NO. III.

STATEMENT SHOWING RESULTS OF PREVENTIVE INOCULATION AGAINST HAEMORRHAGIC SEPTICAEMIA FOR 10 YEARS FROM 1926-27 TO 1935-36 IN 6 BADLY INFECTED DISTRICTS.

Year.	Method inoculation followed.	Number of outbreaks in which inoculation was under- taken.	Number of animals which died uninoculated in course of outbreak.	Number of animals inocu- lated.	Number of animals which died after inoculation.
			Bovines.	Bovines.	Bovines.
		<i>Vizagapatam District.</i>			
1926-27 . .	Serum .	3	15	364	..
1927-28 . .	" .	3	24	392	1
1928-29 . .	" .	..	..	..	..
1929-30 . .	" .	2	13	130	..
1930-31 . .	" .	2	2	128	..
1931-32 . .	" .	2	21	116	..
1932-33 . .	" .	2	19	277	..
1933-34 . .	" .	11	76	1,170	..
1934-35 . .	" .	1	7	111	..
1935-36 . .	" .	10	53	1,950	..
Total . .	..	36	230	4,638	1
		<i>Kistna District.</i>			
1926-27 . .	Serum .	10	272	2,662	3
1927-28 . .	" .	6	70	1,427	4
1928-29 . .	" .	5	82	1,376	..
1929-30 . .	" .	2	8	610	..
1930-31 . .	" .	..	..	..	..
1931-32 . .	" .	2	20	526	9
1932-33 . .	" .	7	131	1,973	..
1933-34 . .	" .	6	95	1,146	..
	Vaccine .	..	..	80	..
1934-35 . .	Serum .	5	71	1,780	3
1935-36 . .	" .	12	126	4,362	..
Total . .	..	55	875	15,942	19

Year.	Method of inoculation followed.	Number of outbreaks in which introduction was undertaken.	Number of animals which died uninoculated in course of outbreak.	Number of animals inoculated.	Number of animals which died after inoculation.
			Bovines.	Bovines.	Bovines.
		<i>Guntur District.</i>			
1926-27 . .	Serum .	8	165	2,155	..
1927-28 . .	" .	4	46	2,104	3
1928-29 . .	" .	5	118	2,370	2
1929-30 . .	" .	..	..	..	..
1930-31 . .	" .	..	..	..	..
1931-32 . .	" .	..	..	..	..
1932-33 . .	" .	..	..	..	..
1933-34 . .	" .	2	28	196	..
	Vaccine	2	28	196	..
1934-35 . .	Serum .	10	138	2,447	..
1935-36 . .	" .	7	105	1,563	..
Total . .	..	38	628	11,031	5
		<i>Nellore District.</i>			
1926-27 . .	Serum .	44	534	8,919	11
1927-28 . .	" .	2	41	349	..
1928-29 . .	" .	1	17	220	..
1929-30 . .	" .	21	468	2,945	..
1930-31 . .	" .	41	237	3,723	0
1931-32 . .	" .	45	583	5,162	19
1932-33 . .	" .	31	434	7,807	23
1933-34 . .	" .	55	544	11,408	40
	Vaccine	3	16	802	2
1934-35 . .	Serum .	93	1,112	17,901	51
1935-36 . .	" .	91	928	25,175	20
	" .	5	47	1,384	..
Total . .	..	432	4,961	86,395	184

Year.	Method of inoculation followed.	Number of outbreaks in which inoculation was undertaken.	Number of animals which died uninoculated in course of outbreak.	Number of animals inoculated.	Number of animals which died after inoculation.
			Bovines.	Bovines.	Bovines.
		<i>Chingleput District.</i>			
1926-27 . .	Serum .	18	211	1,280	8
1927-28 . .	" .	5	57	205	..
1928-29 . .	" .	9	70	595	..
1929-30 . .	" .	32	237	2,404	3
1930-31 . .	" .	21	289	3,005	3
1931-32 . .	" .	14	149	2,267	1
1932-33 . .	" .	32	194	3,659	2
1933-34 . .	" .	17	110	3,230	1
1934-35 . .	" .	48	244	8,927	..
1935-36 . .	" .	30	213	4,573	..
	" .	..	..	146	..
Total . .	..	226	1,774	30,291	18
		<i>Tanjore District.</i>			
1926-27 . .	Serum .	50	483	6,946	..
1927-28 . .	" .	20	149	2,593	4
1928-29 . .	" .	8	99	1,194	2
1929-30 . .	" .	..	..	..	..
1930-31 . .	" .	7	65	718	..
1931-32 . .	" .	13	123	2,997	..
1932-33 . .	" .	45	423	7,556	..
1933-34 . .	" .	20	195	3,027	..
1934-35 . .	" .	30	191	5,154	..
1935-36 . .	" .	49	359	7,809	9
Total . .	..	242	2,087	37,994	15
GRAND TOTAL FOR ALL THE 6 DISTRICTS.	..	1,029	10,555	1,86,291	242

N.B.—B=Bovines.
O=Others.

STATEMENT NO. IV.

STATEMENT SHOWING RESULTS OF PREVENTIVE INOCULATION AGAINST HAEMORRHAGIC SEPTICAEMIA FOR 10 YEARS FROM 1926-27 TO 1935-36 IN THE MADRAS PRESIDENCY.

Year.	Method of inoculation followed.	Number of outbreaks in which inoculation was undertaken.	Number of animals which died uninoculated in course of outbreak.		Number of animals inoculated.		No. of animals which died after inoculation.	
			B.	O.	B.	O.	B.	O.
1926-27	Serum	155	1,806	...	27,496	...	20	...
1927-28	"	49	448	...	8,360	...	12	...
1928-29	"	31	434	...	6,803	...	4	...
1929-30	Vaccine	1	...	...	20	...	...	...
	Serum	61	750	...	6,670	...	5	...
1930-31	"	75	649	...	8,078	...	12	...
1931-32	"	146	1,074	...	24,375	2	33	...
1932-33	"	186	2,305	...	36,159	...	70	...
1933-34	"	186	1,949	8	31,238	45	44	7
	Vaccine	5	44	...	1,078	...	2	...
1934-35	Serum	232	2,704	18	50,759	294	58	...
1935-36	"	373	3,334	7	72,801	...	47	...
Total	...	1,550	16,277	33	2,73,667	341	319	7

APPENDIX V.

NOTE ON SUBJECT NO. 7, BY CAPT. S. C. A. DATTA, B.Sc., M.R.C.V.S., IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.

INTRODUCTION.

In addition to its natural function of supplying a sufficient quantity of milk for its own young, the mammary gland of domesticated milch animals is expected to provide considerable amounts for the use of man. In order that the Dairy industry of a country may be a commercial success, it is essential that the mammary gland of its milch cattle be maintained in a state of complete health, and be capable of functioning at the highest possible pitch. Experience shows that as methods of selective breeding of the high yielding strains of dairy cattle are increasingly adopted the incidence of and the liability to udder affections have become greater. The problem of udder diseases of the cow, goat and the ewe has therefore received attention for a long time in the foremost dairying countries of Europe and the predominant and widely distributed form of chronic streptococcal mastitis, in particular, has formed a major subject of research in England and elsewhere. What with the serious economic losses suffered by Dairy farmers, in having to maintain animals which have been rendered progressively uneconomical due to the partial or complete destruction of the functional tissue during one or more lactations, the deterioration of the quality of milk for nutritional purposes, the occurrence of epidemics of severe illness and even death among human subjects ingesting milk-borne infections of udder origin (Scarlatina, Sore throat, etc.) the subject of the Milk Supply to any given area causes constant anxiety in public health work. The necessity for the universal adoption of measures for rapidly diagnosing and efficiently combating udder infections, and the justification for increasing the technical supervision of dairy cattle for detecting infections during the incubative period, have been stressed in a resolution passed by the last session of the World's Dairy Congress held in Rome-Milan in 1934, and other international bodies have given a place of precedence to the formidable udder complaints threatening the Dairy industry. For the above reasons, and the remarkable fact that in this country the subject of Mastitis of cattle and buffaloes does not appear to have been discussed at any previous meeting of this kind, it is considered opportune to bring it to your attention.

EXISTING KNOWLEDGE.

What is popularly known as *garget* refers to obviously diseased udders containing milk showing well marked changes, but the comprehensive term *mastitis* includes all types of inflammation and disorders, irrespective of severity, and even cases where superficial and deep palpation fails to show any appreciable udder changes or where the milk may not reveal much abnormality, excepting what is disclosed by the use of special laboratory methods. Leaving aside secondary udder changes due to tuberculosis, anthrax, Brucella or other infections and tumour formation, we must mention the specific and primary forms of Mastitis, which are caused by species of Streptococci (usually chronic), staphylococci (acute form often leading to gangrene), *E. coli*, affecting lactating glands, and Summer Mastitis caused by *B. pyogenes*, appearing in dry cows and maiden heifers. Besides these, rare cases of mastitis due to yeasts, actinomyces, organisms belonging to *Bact. lactis aerogenes* group, Necrosis bacillus and *Pseudomonas aeruginosa* have been recorded from different countries. Of these different infections, Streptococcal mastitis has formed the subject of numerous articles. A more or less general agreement has now been reached on the vexed question as to what constitute the characters of mastitis streptococci, whether streptococci of animal origin are distinct from human parasites, and whether saprophytic streptococci can assume a pathogenic role in the udder. The exact economic loss resulting from mastitis, believed to be very great in most countries, is now being estimated statistically by Minett and collaborators, who have dispelled confusion by effecting broad groupings of the udder parasites on serological and biochemical grounds, and by pointing out that while strains indistinguishable from the human types, *Strep. pyogenes* and *S. epidemicus*, do occasionally produce bovine mastitis the Sorbite-positive strains (animal) seldom, if ever, affect man. Without going into detailed bacteriology recent knowledge on methods of infection and spread of the disease must needs be recounted. Although attempts have been made to question the pathogenicity of the bacterial exciting causes mentioned above, failures to infect the udder with massive doses of these organisms experimentally by oral, subcutaneous and intravenous administrations and in other ways have impressed workers repeatedly

as to the presence of predisposing factors. The much blamed milking machines have been exonerated as a result of experiments in Germany, and it is apparent that if these machines are efficiently used they do not set up disease. Artificial infections have been produced by injecting numerous streptococci through the teat canal, but experiments on many cows in different stages of lactation have shown how extremely difficult it is for even highly virulent streptococci to gain entrance through the normal sphincters (Seeleman), though in the presence of a recent injury to the teat canal mastitis readily results. Researches show that overstocking, incomplete milking, wet milking, lack of carbohydrate diet, and overcrowding in the stall are potent predisposing factors. The incriminated cold floors and chills have under experimental conditions failed to lower the resistance of udder tissue. The difficulty generally experienced in producing infection artificially by means of the contaminated hands of milkers, and in transmission experiments designed to approximate natural conditions, has been explained by the American workers, Jones and Little, experimentally by showing that the udder must first be sensitised to streptococci before the organisms can establish themselves. Mastitis has now been produced through infection of the bedding straw by Seeleman, and the commonest natural route of infection appears to be through the teat, but the occurrence of Summer Mastitis in heifers and dry cows remains unexplained, though the agency of insect vectors has been suggested. Explanation is also required as to why mastitis remains localised in one or two quarters even in prolonged infections, and it is believed that mastitis may result from an earlier infection in calfhood or a previous attack of metritis and retained placenta. Record exists of a Holstein-Galloway herd in which a cow, her daughter and a grand-daughter all contracted mastitis but as the observation could not be continued, a hereditary predisposition was not proved.

POSITION IN INDIA.

Turning to India, cases of mastitis of various kinds have no doubt been encountered from time to time, occurring either sporadically or in series. In the absence of any comprehensive Indian data regarding the various micro-organisms present in the secretions of the udder in cases of mastitis, it is not possible to attempt an indication of their relative incidence in different parts of the country. In the only reference available, Edwards (1928) makes the statement that inflammation of the udder is a very common disease among cows, including buffalo cows, usually occurring sporadically (due to *Bacillus pyogenes*), though sometimes several cases may be seen in a herd, and that the most frequent predisposing cause is goring of the udder by other animals, which is especially frequent in buffaloes.

Coming to our own experience we have had the opportunity during the last 18 months or so of examining milk samples from over 20 cases of mastitis in the cow and the buffalo from the Punjab, Bombay, Jaipur, Central Provinces and also from the local Dairy at this Institute. Haemolytic and non-haemolytic strains of *Staphylococcus aureus* have been recovered from the majority of cases, and a highly haemolytic coliform organism has been isolated from several cases, whereas in two instances only a haemolytic streptococcus has been cultivated. Of the cases encountered at Muktesar, it was observed that a mother and a daughter and two direct sisters were affected with mastitis at different times but a definite genetic predisposition was not clear. Again a number of first calf heifers have been found to carry their calf overtime, with marked oedema of the udder, while signs of a mild mastitis often accompanied with the passage of blood in the milk were exhibited at the time of parturition. The rush of blood to the udder preceding secretion of milk may have been very great in these cases, and as suggested in human medicine recently, the mechanism of endocrine balance between the ovarian hormones, and the lactogenic hormone, prolactin of the ant. pituitary, may have been disturbed to precipitate these acute attacks.

DIAGNOSIS.

The recent advances in our knowledge upon Mastitis, briefly reviewed above, have made diagnosis easier, particularly of suppressed and latent cases. The first desideratum is a complete survey of the herd to determine the presence and extent of the disease in the herd and in affected cows. Diagnosis is obvious in clinical cases, but in the more insidious cases special methods are required, such as Systematic clinical inspection, detection of minute clots in the milk by straining samples through a black cloth or by the use of a dish with a blackened surface, by the use of yellow brom-cresol paper which turns purple with mastitis milk but grey with normal samples, and the use of special tubes for reading off the presence of excessive

deposits in abnormal milk. In healthy cases, the pH, chlorine, catalase and lactose values are very constant, but in the case of a deranged udder variations from the normal are present. Smears from milk deposit and cream reveal, on microscopic examination, numerous chained streptococci or *B. pyogenes*. Pooled samples from all quarters may be examined first, and in negative cases individual quarter samples may be tested. In the absence of positive results in a single examination, periodical tests are indicated. But the most reliable method appears to be cultural examination of the fore milk, after rejecting the first few jets. By the use of blood agar plates, a selective medium containing crystal violet and aesculin, or an enrichment medium including 1 per cent. glucose broth, valuable results are obtained. Field workers can forward samples of milk in one ounce bottles. for the purpose of obtaining laboratory diagnosis.

CONTROL.

Predisposing factors or pathogenic bacteria are not capable by themselves of producing the disease, but can do so in association only. While indications are that Group I Streptococcal infections are spread by milkers' hands and can be controlled efficiently by milking infected cows last, the procedure is not applicable to infections with other groups of streptococci (Minett). By segregation alone herds have been freed of streptococcal mastitis (agalactiosis) in England. The value of correct diagnosis is therefore obvious. Generally segregation is inconvenient; frequent, thorough and dry milking reduces chances of spread to healthy animals. Separate accommodation for heifers and infected cows lessens the risk of unsystematic milking, and cows with injured teats should immediately be separated. Prevention by relatively simple hygienic measures undoubtedly is better than attempts at problematical cures. No artificial or natural immunity has been demonstrated so far. Of the chemotherapeutic measures, Iodine therapy ("Selectan."), Rivanol, and its derivatives, Trypaflavine, Entozon (Sodium biborate and dextrose), Azamine, and turpentine (subcutaneously 8 c.c.) have produced apparently satisfactory recoveries. In the experience of Steck in Switzerland, Trypaflavine (0.1 to 0.15 in 1,000 c.c. of water) excelled in slightly altered udder secretions, and Entozon (0.4 in 1,000 c.c. of water) in completely pus-like secretions. Inter-mammary injections of crystal violet (1:10,000) may be tried, and for preventing Summer mastitis a non-absorbable seal within the teat consisting of vaselin, paraffin and Entozon has been successful. To inhibit lactation, already started, *oestrin* may be tried.

APPENDIX VI.

NOTE ON SUBJECT No. 8, BY J. F. SHIRLAW, M.R.C.V.S., IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.

Large numbers of cases of Blackquarter occur in endemic areas in all provinces, and among the diseases of cattle in India it would appear to rank next in importance to Rinderpest and Haemorrhagic Septicaemia.

Although true Blackquarter is due to infection with *Cl. chauvoei*, other organisms of the gas gangrene group have occasionally been implicated in clinical conditions indistinguishable from Blackquarter. Thus *Cl. welchii* has been found not infrequently accompanying infections with *Cl. chauvoei*, and *Cl. ordematis maligni* gives rise to conditions which may resemble Blackquarter so closely that no clinical differentiation is possible. It gives rise to acute septicaemia with local oedema of a very severe character usually involving a fore or a hind quarter and differentiation between this and true Blackquarter can only be accurately established by a bacteriological investigation (Zeisslet, 1923; Wagner, 1925). *Cl. noryi* is also known to give rise to conditions similar to Blackquarter. Robertson (1929) suspects that Kojima (1923) encountered this organism when he described the highly toxic bacillus from a case of Blackquarter. McEwen reports its association in a mixed infection with *Cl. chauvoei*.

It is thus evident that *Cl. welchii*, *Cl. ordematis maligni* and *Cl. noryi* either alone or in a mixed infection can give rise to the clinical condition known as Blackquarter. Therefore, for a vaccine to be successful in any locality, it should have incorporated in it all the organisms that may become incriminated in clinical cases of Blackquarter in that locality. With reference to India, no systematic bacteriological examination of such cases has been carried out. It has been felt that this can only be done by a whole-time worker in a well-equipped laboratory. Pending such an enquiry, we have been compelled to depend upon certain tentatively selected field strains for use as seed for the preparation of our prophylactic products.

The products that have been or are being used for prophylactic inoculation against Blackquarter in various parts of the world may be divided into the following groups:—

(a) *Preparations of spore cultures, or more generally, the dried, or dried and heated, muscle from an infected calf.*—The commonest prophylactics of this group are small pillules for insertion under the skin, as first prepared by Arloing, Cornevin and Thomas (1880), and Kitt (1889). Kitt also introduced a pillule in which spore cultures were incorporated with the meat powder, and simultaneous inoculation with anti-serum was practised in combination with this vaccine (1893-99). Thomas advocated inoculation by means of silk threads impregnated with spores for introduction into the subcutaneous tissue of the tail. Leclainche and Vallee (1900), and Baselet (1925) attempted vaccination with an attenuated culture. The immunity produced by these methods is due to the presence of a valuable but very small number of living spores. It was often found that no two brews of any one of the vaccines of this class, made according to the same technique, conformed to the same standard regarding safety and potency. Certain brews turned out to be dangerous while others turned out to be without potency. For these reasons, these methods have now been superseded by others that are more reliable.

(b) *Immunisation with aggressins.*—This method of immunisation is based on the principle that *Cl. chauvoei*, in common with other anaerobes, is incapable of assuming virulence in the body unless some toxin is present. This organism shows a very poor capacity for proliferation in the body without some degree of local necrosis and tissue destruction, or, of a pabulum of some kind as, for instance, may be found in the alimentary tract. Even when proliferation is taking place, the healthy tissues (McNee and Shaw Dunn, 1917), the sheath of the muscle fibres as well as the endothelium of healthy blood vessels (Arloing, Cornevin and Thomas, 1881, 1887) and undamaged mucous membranes are all valuable and efficient barriers to the spread of infection. When the production of toxin reaches even a very moderate degree of intensity, the phagocytic action seems to be paralysed. Practically speaking the breakdown is always in the first place due to the immediate effect of the absorption of products of the metabolism of the bacteria proliferating in some focus within the body. The consequent cytolytic action spreads very rapidly until becomes very formidable. This method of immunisation therefore aims at preventing this sequence of events, by conferring an anti-toxic immunity, so that the toxins may not accumulate in sufficient quantities as to permit the organism to assume pathogenicity.

(i) *Natural aggressins as advocated by Schöbl (1910, 1912).*—For the preparation of natural aggressins young bovine animals are injected intramuscularly at many spots with live culture. The animals are killed when the local lesions are well advanced, and the muscle juice is expressed. This juice is used either directly after treatment with disinfectants, or after filtration through the Berkefeld candle. This method of inoculation has been much used in the United States of America and was also in vogue in India, having been introduced by Edwards. Although field reports indicate that an immunity against natural infection can be conferred by this method, it has not been possible to demonstrate immunity under controlled experimental conditions at Muktesar.

(ii) *Artificial aggressins composed of filtrates of cultures.*—All authors who have treated this subject with sufficient attention to the underlying bacteriology are agreed upon the general antigenic and immunising capacity of the bacteria-free non-toxic filtrates of *Cl. chauvoei* and upon their specific nature. Arloing, Cornevin and Thomas (1880) first showed that culture filtrates immunised well. The culture may be grown in any of the described media, but the one that was early in use was a 4 days culture in ordinary peptone broth of a neutral reaction with a layer of autoclaved meat. Filtrates made as above, or with other modifications, have been in use in recent years in Japan, France, Switzerland and elsewhere with apparently satisfactory results (Nitta, 1918; Eichhorn, 1918; Grant and Zschokke, 1920; 1926; Leclainche and Vallee, 1913; 1923; Graub, 1924; Zeller, 1924; 1926; Basset, 1925; 1926).

(c) *Immunisation with cultures killed by formalin.*—This method of vaccination first introduced by Leclainche and Vallee (1925) and advocated by Karmann (1927) and McEwen (1926) has already become very popular in many parts of the world. [Leclainche and Vallee, 1925; 1928; McEwen, 1926; Lopez, 1926; Karmann, 1927; Cordier, 1926; Hall, 1929; Schriedhoffer, 1932; Haddow (1934) and others]. The immunity established by the vaccine is both anti-bacterial and anti-toxic and is found to be far superior to that established by natural or artificial aggressins. Scott (1930) has claimed that the addition of certain salts in optimal proportions to the basic medium leads to increased elaboration of toxin and consequently to greater potency of the resulting product.

The bulk of the work within the last decade has been devoted to the evolution of a basic medium for the production of massive cultures for use in the making of formalised vaccine. Previously glucose broth containing pieces of autoclaved meat, pieces of sterile tissue or the heart of an inoculated guinea pig (Cordier, 1926) was used. This had the disadvantage in that debris from tissue used for creating anaerobiosis became mixed with the bacterial emulsion. Scott (1930) advocated the use of cloth for containing the minced tissue, but this does not effectively prevent the appearance of tissue debris. McEwen (1926) introduced a device by which bacterial emulsions could be obtained free of all debris. In this method diffusion shells containing minced liver are placed within conical flasks containing saccharose broth. Sheather (1923) introduced a modification of this method by replacing the diffusion shell with porcelain cells.

Attempts have been made to substitute chemical reducing agents for animal tissues. Thus Booz (1926) following the principle of the McIntosh and Feldes anaerobic jar, has recommended the use of a central catalysing plant for the growth of anaerobes in a series of containers. This method does not seem to have been further developed to warrant its adoption in vaccine manufacture.

Certain substances in the nature of pure chemicals have also been used to replace animal tissues for production of anaerobiasis. Reduced iron (Scott and Brandley, 1933; Antona, 1933), *Sodium hydrosulfit* (Ristowsky and Mankewitsch, 1935), *Brenztraubensäure* (Berthelot) and *Levulinsäure* (Berthelot) have all been shown to have reducing action, but they have so far received scant attention. Certain organic chemical substances containing the sulpho-hydrol group, such as cysteine, glutathion, and thioglycolic acid are also known to be very powerful reducing agents. Frei and Riedmüller (1930) and Frei and Hall (1931) have shown that anaerobes would grow luxuriantly in media containing 0.3 per cent. cysteine hydrochloride. The simplicity of the technique involved in the making of such media is a great point in favour of this medium over those containing tissues. The forbidding cost of the chemicals has been an obstacle against its general use. It has now been found at Muktesar that cysteine hydrochloride can bring about the necessary reduction at a concentration of 0.01 to 0.05 per cent., and this reduces the cost to a reasonable extent. Formalised vaccines made from such cysteine broth cultures have also been found to be not inferior in potency to those made from McEwen's or other well-known media. In some instances cysteine vaccines were actually found to be superior.

That Ascorbic acid (Vitamin C) can bring about the necessary reduction potential for the aerobic growth of anaerobic micro-organisms has been shown by Kodama (1935) and again in greater detail by Ehrismann (1936). Further work appears to be indicated before decision can be taken on the utility of this product for obtaining massive growth.

There is another method to which reference may be made and that is the possibility of acclimatizing *Cl. chauvoei* to aerobic cultivation, without recourse to any elaborate anaerobic technique. Takasana (1927) describes a technique by which *Cl. oedematis maligni* can be accustomed to aerobic growth. Five per cent. peptone water containing five per cent. grape sugar and 0.5 per cent. sodium chloride is prepared. Fresh sterilised pieces of chicken liver are added and the pH adjusted to 7.6 by the addition of 0.2 per cent. anhydrous sodium carbonate. The anaerobe is grown in this medium at 37° C. for 24-48 hours and then transplanted on a series of agar tubes and incubated aerobically. The growth is slow at first but accelerated with repeated sub-cultures. Such aerobic bacilli lose their pathogenicity but retain their immunising values. 3-5 c.c. of an emulsion of the aerobic bacillus prepared by adding a loopful of the agar culture to 5 c.c. of normal saline is found to confer immunity. A similar finding has been made at Muktesar. *Cl. chauvoei* strain No. 2721 of the National Institute of type cultures, which had been kept in subculture in the ordinary way in Robertson's meat medium, was discovered to have become capable of aerobic growth in simple glucose broth. There was an indication in a preliminary test that this strain had lost its virulence for cattle but that it conferred protection against a virulent strain of *Cl. chauvoei*.

The data presented here warrant the conclusion that the best method of prophylactic inoculation at the present day is the employment of whole cultures, formalised if necessary, as advocated by Leclainche and Vallee. Much more work is required, however, for the evolution of a cheap, efficient and easy method of obtaining massive growths for such purposes.

APPENDIX VII.

NOTE ON SUBJECT NO. 9, BY J. F. SHIRLAW, M.R.C.V.S., IMPERIAL VETERINARY RESEARCH INSTITUTE, MURTESAR.

Kumri and Equine Encephalo-myelitis represent clinical variations of a common etiological factor as yet little understood.

That the relationship between the two diseases is an intimate one is an opinion that has been tentatively stated and equally denied by clinicians of experience.

They are similar diseases, in that they both affect the central nervous system of the horse, and in diseases affecting such a highly organised system, the diversity of the type of lesions and its functional expression are the features to be considered. It is only upon an accurate study of the reactive phenomena—in conjunction with detailed study of the nervous lesions at *post-mortem*—that any attempt can logically be made to correlate these two diseases of apparent dissimilar nature.

Kumri and Equine Encephalo-myelitis have much in common epizootologically. Incidence is largely controlled by seasonal variation, climatic and dietetic factors. On purely clinical considerations, Kumri possesses a well-defined train of symptoms with little variation. Equine Encephalo-myelitis is more variable in its outward expression varying between manifestations of acute cerebral symptoms (true encephalitis) and mild exhibitions, always progressive, of symptoms referable to involvement of the spinal cord true myelitis.

In naturally occurring outbreaks of Equine Encephalo-myelitis it is usual to encounter cases pursuing a course which is indistinguishable from classic Kumri.

Pathologically, the two diseases are characterised by an absence of gross anatomic change. Occasionally in both diseases, tissue haemorrhages—especially haemorrhage in and around the cord—are encountered, although the latter are more common in the acute "explosive" type of encephalitis.

It is in the central nervous system that are found the features that justify the assertion that Kumri and Equine Encephalo-myelitis, if not actually identical are, at least, most intimately related.

Study of the histopathology of the spinal cord and brain stem reveals a similarity of lesions so striking that little doubt remains that, in both diseases, there is a common factor producing a common effect, varying only in degree.

The etiology of Kumri and Equine Encephalo-myelitis remains obscure, but since there is a pronounced neurological similarity to certain diseases of the human subject—of virus origin—considerable suspicion attaches to the possibility of a neurotropic virus being of etiological significance.

APPENDIX VIII (a).

NOTE ON SUBJECT No. 10, BY MR. E. S. FARBROTHER, DIRECTOR OF VETERINARY SERVICES, BOMBAY.

In my experience the more important diseases of sheep and goats in India are Anthrax, Foot and Mouth Disease, Pasteurellosis, Variola, Pleuro-pneumonia and Scab. It is claimed by some that sheep are also subject to natural infection by the rinderpest virus. According to the International Convention for the Campaign against Contagious Diseases of Animals, the most important of these diseases from the point of view of export are Anthrax, Foot and Mouth Diseases and Variola.

It is difficult to form a correct idea of the true incidence of these diseases in this country. My experience, which is limited to the Bombay Presidency, Sind and Baluchistan, is that outbreaks of disease among their flocks are rarely reported by shepherds. This class of people, in the Bombay Presidency, at any rate, are extremely shy, ignorant and primitive and, for the most part, are nomadic; to obtain any real information concerning the diseases affecting the flocks, it is often necessary to go out and look for it. There are, however, occasions when outbreaks of disease are reported and there can be no doubt that they are much more widespread and serious in their effects than statistics would indicate.

Under the conditions mentioned above, the control of these diseases presents very great difficulty. The periodic dipping of sheep even with a portable apparatus or regular vaccination against Anthrax for instance, in a constantly moving population appears to be almost impossible, and legislation would be difficult to enforce.

What appears to be the first essential is the education of the shepherd to the enormous losses which he sustains from preventible diseases and to obtain his confidence in the value of preventive measures. I suggest that the first step in this direction is a remodelling of Veterinary Services in India so as to provide a mobile corps of officers each capable of moving constantly within his own jurisdiction thereby coming into more frequent and closer contact with the more backward classes of livestock owners than he can do when based on a stationary dispensary as is now usually the case. If such mobile corps were available, the question of disease control as a whole would be considerably simplified and the education of livestock owners generally in matters concerning their stock greatly speeded up.

I have been asked in this connection to lay stress in particular on the details for a quarantine station for one of the principal Indian ports. The number of sheep and goats exported annually from Bombay is negligible and during the past three years was 18 only. These were apparently intended for purposes of food. There is no export of these animals for trade purposes and the position is presumably much the same in other parts of India with the exception possibly of Madras from which Presidency I understand that large numbers are exported annually to Ceylon. The question of enforcing quarantine regulations does not therefore appear to arise. What does appear to be important, however, is to endeavour to ensure that the products of these animals, of which large quantities are exported annually *through* Indian ports, are free from infection and the question of how to ensure this freedom is one which deserves serious consideration.

APPENDIX VIII (b).

NOTE ON SUBJECT No. 10, BY MR. BALWANT SINGH, DISEASE INVESTIGATION OFFICER, BENGAL

In India, as in most other countries, the incidence of diseases of sheep and goats causes enormous loss to the stock owners. Instances are available that the effects of some outbreaks of the disease were almost complete extinction of the herds. The disease when it finds favourable and fertile soil to propagate, adopts a virulent form and as such spreads rapidly through the mechanical agents and vectors. These circumstances create grave danger more especially in the countries where there are no natural barriers or strict system of quarantine measures. Similarly instances are also available that the export of animals from India to other countries which were either naturally free or the diseases were eradicated at the enormous cost, was a direct cause of re-introduction of diseases. It may not be out of place to mention that recently certain consignments of goats were imported from India into the Federated Malaya States and the Straits Settlements and there, on arrival at the quarantine station at Malaya, it was discovered that these animals were exhibiting symptoms of ill health, and that some of these animals as well as the other of the same consignment, which were kept segregated, subsequently died of a disease to which local goats were proved to be susceptible. In one instance the disease was diagnosed as *Contagious caprine pleuro-pneumonia* whilst in another the disease could be described as an *infectious* or *contagious pneumo-enteritis*. Other goats showed lesions of Goat pox, a disease which caused very heavy loss in local animals.

While studying the incidence and suggesting the control measures for the contagious diseases, the danger of a disease occasionally taking a virulent form, should always be borne in mind. The spread of a disease mostly depends upon the suitable soil for the propagation of the causative agent. For instance a disease may run a very mild course in one country or locality and breed of animals and may be a cause of heavy mortality in another country or in a more susceptible breed. However, the following diseases of sheep and goats are more important from the point of view of export of these animals from India.

Anthrax.

Anthrax in sheep and goats has been appearing in India in a peracute form from the time immemorial and is responsible for causing heavy mortality. The disease from the view point of human and animal health and industry bears the foremost importance and requires very strict measures to be adopted.

Control.—In India serum therapy in the actual outbreaks of the disease has been practised with very good results. In cases the disease has taken up a virulent form, and a longer course the application of serum therapy is a very costly affair. In such circumstances vaccination has advantage over the serum therapy. In a consignment of sheep and goats intended for export, where the disease is not already existing, serum therapy is more safer and economical.

Malta fever in goats.

The disease is caused by *B. Melitensis* which organism is responsible for *undulating fever* in man, therefore, the incidence of this disease is most important.

The incidence of this disease in India as published by Mr. S. R. Hassan is rather high more especially in the localities where there is common practice of drinking un-boiled milk. The infection of this organism in human beings in India has also been recorded on more than one occasion.

Control.—There should be a detailed study of this disease in all the provinces in India. Serum from all the goats intended for export should be tested and those giving positive reactions rejected.

Contagious pleuro-pneumonia in goats.

The disease has been appearing in India from a considerable time. Reports are available that this disease was responsible for heavy losses in the North-West Frontier Province, Baluchistan and Western Coast of India. More recently outbreaks have been reported from Madras Presidency. The disease has more or less seasonal and regional distribution and it is probable that it has been appearing in other parts of India where the conditions of those parts mentioned above are similar.

Control.—So far the aetiology of the disease remains to be worked out. *B. bipolaris exsiccatus* as a definite cause of the disease requires confirmation. Mr. Mobbs and the writer of this note (at the Imperial Veterinary Research Institute, Muktesar) had on several occasions isolated a pasteurilla from the lungs of goats died of pleuro-pneumonia (rinderpest) but in no instance was the organism capable of re-producing the disease. However, of late, it is learnt that the Director, Imperial Veterinary Research Institute, is contemplating the preparation of a suitable vaccine.

Rinderpest.

Sheep.—This disease in the artificially inoculated sheep produces a mild febrile reaction only. There is no record in India that the disease was responsible for the outbreak in sheep.

Goats.—Brief accounts of rinderpest as it occurs in goats are to be found in the writings of such early workers as Galambos (1861), Koch (1897), Topacio (1926). In India, Edwards (1927), Cooper (1931), D'Costa and Balwant Singh (1933), Kerr (1935) and Saunders and Kailasam Iyer (1936). The clinical symptoms of rinderpest in goats, particularly its pneumonic form presents a considerable degree of resemblance to that of contagious pleuro-pneumonia and the differential diagnosis in such circumstances is very important factor. However, when rinderpest is suspected in goats, such a suspicion should doubtless be regarded as warranted; if there is a history of rinderpest outbreak in cattle in the neighbourhood—it is always a good plan to seek confirmation of the diagnosis by the sub-inoculation of blood into susceptible cattle.

Control.—As stated above the definite and confirmed outbreaks of rinderpest in India have not yet been established therefore, very little work on the immunology of this disease in goats has been carried out.

Black-quarter.

The disease in sheep has been reported to be in an enzootic form and causes heavy mortality. Artificially inoculated sheep shows a course simulating to that in calves.

Control.—If there is actual outbreak the serum and vaccine prepared and supplied from Muktesar give excellent results.

Pox.

Sheep.—The pox in sheep is of common occurrence in India. Mortality varies from 20-40 per cent.

Goat.—The pox in goats in India is also prevailing but not with the same intensity as sheep pox. It is also presumed that most of the outbreaks of goat pox in India are of the sheep pox origin.

Control.—Recently ovination against sheep pox has been conducted with lymph in Madras Presidency but the results of the tests are awaited. The disease can be controlled by the hygienic measures.

Foot and Mouth Disease.

The disease has been reported to be prevailing in sheep and goats in India.

Control.—Hygienic measures can be applied to control the disease.

Contagious ecthyma in goats.

The disease is of common occurrence in India. The affection is more confined in the anterior portion of the mouth with marked swelling of the lips.

Control.—The disease can be controlled by hygienic measures.

Skin Diseases—Mange.

The mange in sheep and goats is of common occurrence in India and causes great loss to the stock owners in the way of waste of bi-products (wool, etc.).

Control.—The disease can be controlled by regular dipping and proper cleaning of the respective kraals.

The other diseases, such as *tuberculosis*, *John's disease* in goats, *chronic pneumonia* and *catarrhal fever* of sheep, *pasteurellosis* in sheep and goats, *paratyphoid* in sheep and skin infection caused by *Precis Nocard bacillus* but the occurrence so far established is very rare.

Suggestions for the quarantine regulations and control measures of animals exported.

It is an established fact that the most rational way of control and the safest prophylactic measure to stop the communication of diseases from one country to another consists in a quarantine. As a result of practical application of this principle certain European countries have been freed of the most serious contagious diseases, which in the past, from time to time, existed with such vehemence that millions of cattle fell victim (e.g., rinderpest, glanders, rabies, contagious pleuro-pneumonia in England.) It is needless to say that the enforcement of quarantine regulations will bring about a small additional expense on the part of dealers but it is much cheaper when compared with the loss which the whole country has to undergo by closing down of trade of export of animals to foreign markets. However, the following quarantine regulations and control measures for sheep and goats exported from Indian ports are suggested.

There should be quarantine kraals at least two at each port with suitable accommodation depending upon the number of sheep and goats exported. Each kraal may be divided into few blocks for the isolation of those animals showing signs of ill health.

The question of limitation of quarantine period at the port prior to the embarkation is a very complicated one, because of the fact that some diseases have very uncertain period of incubation. At the same time the question of economy on the part of stock dealer has also to be considered. Having both the points in view it would be advisable to fix fifteen days as quarantine period for all these animals.

During this quarantine period careful observations and necessary tests should be carried out. Finally a certificate authorising the embarkation of these animals be issued by a fully qualified Veterinarian whose certificate would be acceptable in the importing countries. The certificate should be issued on an approved form authorised by the Government.

APPENDIX VIII (c).

ESTABLISHMENT OF QUARANTINE STATIONS AT THE PRINCIPAL PORTS OF INDIA, BY CAPT.

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As a safeguard against the introduction of contagious diseases, Great Britain, the British Dominions and Colonies as well as other Foreign countries require that all livestock exported from India into their countries shall be certified by a competent authority to have been quarantined for a period of about a fortnight immediately before shipment in an approved quarantine station. Having at present no suitable quarantine station at any of her ports and thus being unable to fulfil the aforementioned demand of certain countries, for certification India has, during the past few years, lost much of her export trade in livestock. There is no doubt about the fact that this trade was at no time very great (*vide* Appendix I) but howsoever small it might have been, the benefits accruing from the same to the country's breeders have been lost. The prohibition orders promulgated by a majority of the foreign countries with regard to the importation of livestock from India have greatly discouraged Indian breeders. Facts, however, would remain as facts. Countries that have enforced enactments prohibiting importation into their countries of Indian livestock cannot reasonably be asked to lift such embargoes until India herself first put her own house in order and meets their demands. "The customer is never wrong" is an obvious truth which is recognised today by all intelligent commercial heads. Along with other steps, one great step towards her livestock improvement would be to establish conditions as would stimulate her export trade in livestock. For this purpose the establishment of suitably constructed and properly organised quarantine stations at the principal ports of India (Bombay, Calcutta, Madras, Karachi and Cochin) appears to be an immediate necessity. At such stations the Government authorities should be made responsible for examining animals before admission into such stations, for visiting and inspecting animals at least once each day throughout the period of quarantine, for providing veterinary supervision and for a final veterinary inspection ensuring a clean bill of health before any animal was loaded on board ship.

The object of having quarantine stations is to provide facilities for the detention and isolation of all livestock meant for export to other countries under official veterinary supervision for a period of at least 14 days immediately before shipment, that is to say, a period sufficient to cover the maximum period of incubation of a majority of the common contagious diseases of animals with a sufficient margin. The accommodation to be provided at each station would obviously depend upon the number of animals expected to be dealt with at any one time.

In choosing the site for the establishment of a quarantine station particular care should be taken to select a place so isolated as to eliminate any risk of the introduction into the station from outside sources of any infection from ordinary causes. It is equally important to obtain the sanction of a competent veterinary surgeon before any plans for the construction of quarantine stations are finally approved and passed. Furthermore, a suitable set of rules should be framed for the control of such stations in order to ensure the healthy condition of animals admitted to and shipped from the quarantine station, and to prevent infection entering the station either by persons, animals or other things.

A set of tentative quarantine rules for livestock to be exported from India to other countries is given in Appendix II. It is presumed that these rules will be incorporated in the proposed Animal Contagious Diseases (India) Act, 19 like Model Rules on different diseases, and in that case the addition of the following sub-clause to Section 36 (2) of the proposed Act would appear to be necessary:—

"(4) regulate the inspection, quarantine and certification of livestock meant for export from British India to other countries."

APPENDIX I.

STATEMENT SHOWING THE NUMBER AND VALUE OF LIVESTOCK EXPORTED FROM INDIA FROM 1930-31 TO 1935-36.

Year.	Cattle.		Horses.		Sheep and Goats.		Other Animals.		Total Value of Live-stock.
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	Exports.
		Rs.		Rs.		Rs.		Rs.	Rs.
1930-31	1,939	2,50,540	6	14,300	1,13,826	20,58,912	2,02,321	2,70,122	26,00,074
1931-32	756	84,903	2	1,500	67,533	12,77,509	1,16,040	1,34,876	14,98,848
1932-33	946	82,019	32	64,000	39,689	7,78,653	46,078	1,85,334	11,10,046
1933-34	779	72,095	53	50,050	40,420	7,85,045	92,021	72,483	9,79,673
1934-35	778	61,771	69	2,16,230	47,338	52,39,428	1,19,510	1,06,849	56,24,278
1935-36	407	31,905	28	32,400	39,913	7,23,472	2,27,680	1,38,421	9,26,198

APPENDIX II.

TENTATIVE QUARANTINE RULES FOR LIVESTOCK TO BE EXPORTED FROM INDIA TO OTHER COUNTRIES.

In exercise of the powers conferred by Section 36 (2) (h) of the Animal Contagious Diseases (India) Act, 19 , the Governor-General in Council is pleased to make the following rules to regulate the detention, inspection, quarantine, etc., of all livestock meant for export from British India to other countries :—

Rule 1.—For the purpose of these rules, unless there is anything repugnant in the subject or context, the following expressions have the meanings hereby respectively assigned to them, that is to say :

- (a) "*Livestock*" includes cattle, buffaloes, sheep, goats, horses, mules, donkeys, pigs, dogs, monkeys and all other primates; cats and all other carnivora; elephants; wild swine; zebras and all other equines; camels, antelopes and all other ruminants; rabbits and all other rodents; poultry including domestic fowl, turkeys, geese, ducks and pigeons and all other birds.
- (b) "*Export*" means taking away by sea from the ports of Calcutta/Madras/Bombay/Karachi/Cochin with the intention of landing at ports of countries other than British India.
- (c) "*Government Veterinary Officer*" means the Government Veterinary Officer for the city and harbour of Calcutta/Madras/Bombay/Karachi/Cochin or any Officer subordinate to the Director of Veterinary Services, Bengal/Madras/Bombay/Sind/Cochin State who is generally or specially authorised by him to perform all or any of the duties of the Government Veterinary Officer under these rules.
- (d) "*Tuberculin Test*" means the testing of animals with Tuberculin, either by the sub-cutaneous or double intra-dermal method, to determine whether they are affected with tuberculosis or not.
- (e) "*Mallein Test*" means the testing of equines with Mallein to determine whether they are affected with glanders and farcy or not.
- (f) "*Certificate of Origin*" means a certificate granted by the Government Veterinary Officer at the time the livestock, that is meant for export from British India to other countries leave the quarantine station for shipment from the ports of Calcutta/Madras/Bombay/Karachi/Cochin, certifying as to the freedom from infectious and contagious diseases of the livestock and showing the name and address of the exporter, the consignee, the destination, the shipping marks and the kind, sex, number and description of animals.

Rule 2.—The exportation by sea from British India of livestock to other countries is prohibited except at the ports of Calcutta/Madras/Bombay/Karachi and Cochin.

Rule 3.—All livestock to be exported from British India to other countries shall be detained in quarantine at such place and in such manner and under such conditions as the Government Veterinary Officer may direct for not less than 14 days or until such time as the Government Veterinary Officer is satisfied as to their freedom from disease.

Rule 4.—On receipt of information from the exporter or shipper the Government Veterinary Officer shall arrange to take charge of all livestock to be exported at least 15 days before the date of shipment at the quarantine station or any other place specified by him with such particulars as are required to fill the Certificate of Origin.

Rule 5.—During detention in quarantine every animal shall be under the control of the Government Veterinary Officer, or other Veterinary Officer deputed by him, and no person shall be allowed to obtain access to it or to feed without the express permission of the Government Veterinary Officer. If permission to feed it is withheld the Government Veterinary Officer shall arrange for the upkeep of the animal, and all expenses thereon, as well as other incidental expenses shall be recoverable from the exporter or his shipper.

Rule 6.—The exporter or his shipper shall deposit with the Government Veterinary Officer Rs. 15 in respect of each animal to be exported at the time of making over charge of the animals as an advance towards the cost of the detention of such animal in quarantine and expenses incidental to such detention. From this amount the charges of, and incidental to, detention in quarantine shall be deducted after the animal has left the port, and the balance, if any, shall be refunded to the owner.

Rule 7.—During the period of quarantine the Government Veterinary Officer shall cause all cattle and buffaloes to be tested by the Tuberculin Test to determine whether they are affected with Tuberculosis or not. In negative cases he shall certify as to the freedom from Tuberculosis of the animals in the Certificate of Origin.

Rule 8.—During the period of quarantine the Government Veterinary Officer shall cause equines to be tested by the Mallein Test to determine whether they are affected with Glanders and Farcy or not. In negative cases he shall certify as to the freedom from Glanders and Farcy of the animals in the Certificate of Origin.

Rule 9.—During the period of quarantine the Government Veterinary Officer may subject or cause to be subjected any animal meant for export from British India to any test that, in his opinion, is necessary for finding out the freedom from disease or otherwise of the animal.

Rule 10.—The cost of medicines, protective sera or vaccines and carrying out certain tests for ascertaining the existence of any disease during the period of quarantine shall be recoverable from the exporter.

Rule 11.—Any animal in quarantine which is certified by the Government Veterinary Officer to be affected with a contagious disease shall be dealt with under the provisions of the Animal Contagious Disease (India) Act, 19 .

Rule 12.—The carcase of any animal dying during the period of quarantine shall be dealt with in accordance with the instructions issued by the Government Veterinary Officer in this respect who shall also forthwith send an intimation to this effect to the exporter or his shipper. The cost of disposal of the carcase shall be borne by and recoverable from the exporter or his shipper.

Rule 13.—No compensation shall be payable to the exporter or his shipper for any animal dying from whatever cause during the period of quarantine under the Government Veterinary Officer.

Rule 14.—Such fodder, bedding, manure, harness, clothing or fittings appertaining to an animal certified by the Government Veterinary Officer to be suffering from a contagious disease under Rule 11, or dying during the period of quarantine under Rule 12, as are likely in the opinion of the Government Veterinary Officer to propagate disease shall be burnt or otherwise destroyed; the remainder, if any, may be sold after proper disinfection. No compensation shall be payable to the exporter or his shipper for anything destroyed under this rule.

Rule 15.—The amounts realized by sales held in accordance with the provisions of Rule 14 shall be paid to the exporter or his shipper.

Rule 16.—No animal detained in quarantine shall be removed from the quarantine station without the permission of the Government Veterinary Officer, and such permission shall be withheld until the Officer has certified the animal to be free from

contagious disease and all charges due on account of the animal under Rules 5, 6, 10, and 12 have been paid or otherwise adjusted out of the advance paid by the exporter or his shipper in accordance with Rule 6.

Rule 17.—The milk obtained from any female animal under quarantine shall be boiled in the quarantine station and shall either be handed over to the exporter or his shipper or be sold by the Government Veterinary Officer and the proceeds therefrom credited to the account of the exporter or his shipper.

Rule 18.—No animal shall be allowed to be exported by sea to a foreign country from the ports of Calcutta/Madras/Bombay/Karachi/Cochin unless it is certified by the Government Veterinary Officer to be free from the infectious and contagious diseases mentioned in the Schedule and is otherwise healthy and fit for export; such inspection and certification shall be made within 24 hours of embarkation.

Schedule of Infectious and Contagious Diseases.

Bovines	Foot and Mouth Disease. Tuberculosis. Hæmorrhagic septicæmia. Rinderpest. Pleuro-pneumonia contagiosa. Blackquater. Cow-pox.
Equines	Glanders and Farcy. Epizootic lymphangitis. Dourino. Surra. Mange.
Sheep and Goats	Pleuro-pneumonia. Scab. Sheep pox.
Pigs	Swine fever. Swine erysipelas.
Fowls	Tuberculosis. Fowl Typhoid. Fowl Cholera. Avian distemper.
General (Other Animals)	Rabies. Anthrax. Mange.

Rule 19.—On the day of shipment of animals from the port the Government Veterinary Officer shall make over the charge of animals to be carried by sea to the master or person in charge of the vessel carrying the animals along with a Certificate of Origin and a certificate of freedom from disease of the animals exported from British India.

Rule 20.—The Government Veterinary Officer shall prepare Certificates of Origin in quintuplicate for each consignment and hand over one copy of it to the master or person in charge of the vessel carrying the animals exported, and one copy to the exporter and two copies to the shipper to be used only for purposes of effecting the transportation and delivery of the consignment and one copy shall be kept with him for record.

Rule 21.—Any animal in the quarantine station which is unclaimed or otherwise not cleared or shipped for a period of 30 days may be sold at auction by the Government Veterinary Officer. From the sum realized by sale the sum due by the exporter or his shipper shall be deducted and the balance, if any, credited to the exporter or his shipper. If no one is willing to purchase such animal at auction it may be destroyed at the discretion of the Government Veterinary Officer.

Rule 22.—Any person committing, or aiding, abetting, counselling or procuring the commission of any breach of the provisions of the above rules or of any rules made hereunder shall be liable, on summary conviction, to a penalty of Rs. 100.

APPENDIX IX.

NOTE ON SUBJECT No. 11, BY MR. M. I. MALIK.

The object of this note is more to focus the attention of Research workers and others engaged in the manufacture of Sera and vaccine in India to the desirability of elaborating a satisfactory vaccine against Anthrax than to give a learned discourse on the subject. All I desire is to initiate a discussion on a subject which now and again confronts field workers like us, and thus obtain valuable assistance and information from the learned members of this assembly.

Vaccines has been in use against Anthrax in Europe, America, South Africa, Japan and even as near at home as Burma over a considerable period but we have had to content ourselves in India with serum alone. Field workers here are placed in a disadvantageous position when compared to other advanced countries specially when the viability of Anthrax spores is the bogey they have to contend with.

A statement showing the number of outbreaks of anthrax, seizures and deaths in various provinces is attached as an annexure to show the extent to which Anthrax is prevalent in British India. This will reveal the importance of the subject.

In a learned assembly like this it would be useless for me to enumerate the advantages a vaccine enjoys over a serum for immunization purposes. I will therefore content myself with a few remarks about the vaccines that are being employed against anthrax

At present the following vaccines are recommended by various workers :—

- (a) Vaccine prepared according to Pasteur's method. This consists of an attenuated culture of Anthrax Bacilli.
- (b) Spore-Vaccine.

In this vaccine attenuated Anthrax spores are utilized.

The value of these vaccines may be assessed by bearing in mind the following important factors which are essential for any good vaccine :—

- (i) Vaccine must be safe.
- (ii) It must be potent.
- (iii) It should have keeping properties.
- (iv) It should be inexpensive.

"Pasteur's Vaccine" was first elaborated towards the end of the last century and has served its purposes within limitations. The organisms in this vaccine are in vegetative forms and, therefore, are liable to early deterioration specially if preservatives are added. It is, therefore, comprehensible that a vaccine once potent may become useless after a lapse of time and its use may give false security. In the hands of various workers this vaccine has produced variable results; sometimes producing severe reactions while at others failing to produce any immunity. In South Africa the results have been so disappointing that its use has been totally discontinued.

"Spore Vaccine" was first introduced in 1920, and has since gained greatly in popularity at the cost of the former vaccine because of its constancy. It was at first feared that spores would be more dangerous but this belief has not been substantiated by experience. Because of their resistance the number of spores in a given dose has remained constant over a considerable period and the vaccine more reliable. Depending on the same property it has been possible to add fairly strong preservatives to the vaccine thus eliminating the danger of contamination.

Reports from South Africa and Burma show that while Pasteur's vaccines were unreliable and caused a number of accidents the spore vaccine after the preliminary difficulties were overcome, gave uniformly satisfactory results. It is claimed that this vaccine confers an immunity as early as the 10th day (though the optimum is not reached till about the 3rd week) which lasts over a period varying from 12 to 16 months.

Another method of immunization worthy of consideration is one in which serum is used with vaccine (Sero-Vaccine). In Europe and America the method is employed by some but experiments in South Africa both under laboratory and field conditions except in very special cases did not show any superiority of this method over spore vaccination.

ROUTES OF INOCULATION.

- I. Subcutaneous route.
- II. Scarified skin route.
- III. Intradermal route.

To overcome the severe reactions to the vaccine in more susceptible animals various workers tried the above enumerated routes of inoculation and claimed superiority of one over the other. A reference to the literature on the subject, however, reveals a lack of uniformity amongst different workers on the subject. Extensive experiments were carried out in South Africa to establish the truth of these claims and I cannot do better than to quote Viljoen Curson and Fourie who opine that "there is no well marked difference in the degree of immunity conferred on sheep by vaccines applied in the following ways subcutaneously intradermal and scarification of the skin. If any difference at all, it will be found to favour of the subcutaneous route".

Statement showing the prevalence of Anthrax in India during the years 1933-34 and 1934-35.

Province.	Total outbreaks.		Total seizures.		Total deaths.		Remarks.
	1933-34.	1934-35.	1933-34.	1934-35.	1933-34.	1934-35.	
1	2	3	4	5	6	7	8
Assam . . .	53	36	1,119	839	1,119	839	
Bengal . . .	15	27	329	1,167	329	1,167	
	...	...	1*	...	1*	...	* In Equine.
Bihar and Orissa	19	44	120	246	104	246	
	...	...	1*	3*	1*	3*	Ditto.
United Provinces .	...	10	924	276	924	276	
Punjab . . .	1	...	3+1* ponies.	...	3+1* ponies.	...	Ditto.
North-West Frontier	1	1	60	12	55	12	
	...	...	590†	...	568†	...	† In other animals.
Bombay . . .	30	...	371	...	240	...	
Madras . . .	23	26	3,612	2,300	3,612	2,300	
Central Provinces and Berar	277	248	1,342	1,670	1,342	1,670	

APPENDIX X.

NOTE ON SUBJECT No. 12, BY MR. E. J. BRUEN, LIVE STOCK EXPERT TO GOVERNMENT OF BOMBAY.

This Act was introduced to facilitate Cattle Improvement in this Presidency by wholesale castration of undesirable bulls. The Act of 1933 was supplemented by Rules for the correct working of the Act and the Rules are known as "The Bombay Live Stock Improvement Rules, 1935".

The Act is applied only to those villages in which the Department of Agriculture and the District Local Board have consented to work the Act. When this joint consent is obtained, Government is approached and the villages selected are notified in the Government Gazette.

At present only two villages in each of two districts have had the Act applied to them and it is rather premature at this stage to pass any comments on the usefulness or otherwise of the Act.

The Act and the Rules are self-explanatory and need no explanation.

BOMBAY ACT No. XXII or 1933.

(First published, after having received the assent of the Governor General, in the "Bombay Government Gazette" on the 1st December 1933.)

An Act to provide for the improvement of live-stock.

WHEREAS it is expedient to provide for the improvement of live-stock in the manner herein provided; And whereas the previous sanction of the Governor-General required under sub-section (3) of section 80A and the previous sanction of the Governor required under section 80C of the Government of India Act have been obtained for the passing of this Act; It is hereby enacted as follows :—

1. *Short title.*—This Act may be called the Bombay Live-stock Improvement Act, 1933.

2. *Extent.*—(a) Section 1 and this section extend to the whole of the Presidency of Bombay.

(b) On a written application made—

(i) by the district local board with the previous concurrence of the Director of Agriculture, or

(ii) by the Director of Agriculture with the previous concurrence of the district local board.

Government may, by notification in the *Bombay Government Gazette*, direct that the remaining provisions of this Act shall extend to any village in respect of which the application has been made.

(c) Section 1 and this section shall come into force at once and the remaining provisions of this Act shall come into force in any village to which the said provisions shall have been extended under sub-section (b) on such date as Government may by notification in the *Bombay Government Gazette* appoint.

3. *Definitions.*—In this Act, unless there is anything repugnant in the subject or context—

(1) "Cow" includes a heifer;

(2) "Director of Agriculture" means the officer appointed for the time being to be the Director of Agriculture;

(3) "Licence" means a licence granted under section 6;

(4) "Live-stock officer" means an officer or person appointed or invested with powers under section 4;

(5) "Prescribed", with its grammatical variations, means prescribed by rules;

(6) "Rules" means rules made under section 23;

(7) "Village" means a village as defined in the Bombay Land Revenue Code, B.M. 1879; and

(8) "A person is said to keep a bull", if such person owns the bull or has the bull in his possession or custody.

4. *Appointment of live-stock officer.*—Government may, by notification in the *Bombay Government Gazette*, appoint the Director of Agriculture or any other officer of the Department of Agriculture to be a live-stock officer and assign to such officer such powers and duties under this Act, as they may deem fit.

5. *Prohibition for keeping a bull for breeding purposes.*—No person shall keep a bull which has attained the prescribed age except under and in accordance with the terms, conditions and restrictions of a licence granted under section 6.

6. *Grant of licences.*—Every licence for the keeping of a bull shall be granted by a live-stock officer authorised by Government by general or special order in this behalf in such form, for such period, and subject to such terms, conditions and restrictions as may be prescribed :

Provided that no fee shall be charged for the grant of a licence.

7. *Refusal to grant or revocation of licence.*—(1) Subject to rules, the live-stock officer authorised to grant the licence may refuse to grant or may revoke a licence, if in the opinion of such authority, the bull appears to be—

(a) of defective or inferior conformation and likely to beget defective or inferior progeny; or

(b) permanently affected with any contagious or infectious disease; or

(c) permanently affected with any other disease rendering the bull unsuitable for breeding purposes.

(2) The live-stock officer granting a licence may also revoke a licence, if in the opinion of such officer there be any breach of any of the terms or conditions of the licence.

(3) No person shall be entitled to any compensation for the revocation of a licence under sub-section (1) or (2).

(4) If a licence is revoked under sub-section (1) or (2), the live-stock officer revoking the licence shall give notice to that effect to the owner or the person stated therein to be the owner of the bull and any such notice given in respect of a licence shall state the grounds for the revocation.

(5) If the notice is duly given in accordance with the last foregoing sub-section to a person who is not the owner of the bull, it shall be the duty of that person forthwith to take all reasonable steps to inform the owner accordingly, and if he fails to do so, he shall indemnify the owner against any loss the owner may suffer by reason of the failure.

8. *Grant of duplicate of licence.*—When the live-stock officer granting the licence is satisfied that a licence granted under section 6 has been lost or destroyed, such officer may, subject to such conditions as may be prescribed, issue to the holder of the licence a duplicate thereof, and thereupon all the provisions of this Act with respect to the licence shall apply to the duplicate as if it were the original licence.

9. *Duration of licence.*—A licence granted in respect of a bull shall remain in force until—

(a) the period specified therein expires, or

(b) it is revoked under this Act, or

(c) the bull dies or is castrated in the prescribed manner.

10. *Inspection of bulls.*—Any person who keeps a bull shall at any reasonable time, at the place where the bull is for the time being or at any other reasonable place, submit the bull for inspection by any live-stock officer when, required by such officer to do so and render all reasonable assistance to that officer for the purpose of inspection.

11. *Power to order castration of bulls.*—(1) A live-stock officer may, by notice served in the prescribed manner, require that any bull which has attained the prescribed age at the date when the notice is served and in respect of which no licence is for the time being in force under this Act, shall be castrated in a prescribed manner within one month after the notice takes effect. Such castration shall, if the owner or other person who keeps the bull requires, be performed or caused to be performed by the live-stock officer free of charge.

(2) For the purpose of this section, a notice shall be served on the owner of the bull or on any other person who keeps the bull.

(5) If a notice under this section is duly served on a person who is not the owner of the bull, it shall be the duty of the person forthwith to take all reasonable steps to inform the owner accordingly, and, if he fails to do so, he shall be liable to indemnify the owner against any loss the owner may suffer by reason of the failure.

12. *Duty to produce licence.*—It shall be the duty of any person who for the time being keeps a bull, if a licence is in force in respect of the bull, to produce the licence—

(a) within a reasonable time on demand made by a live-stock officer or an officer of the Agricultural or Veterinary Department authorized by general or special order by Government in this behalf in any place where the bull is for the time being,

(b) before a cow is served by a bull on demand made by the person in charge of the cow.

13. *Penalty for keeping a bull in contravention of this Act or rules or without or in contravention of licence.*—Whoever in contravention of this Act or any rule or order made under this Act or of any terms, conditions or restrictions of licence keeps a bull shall, on conviction, be punishable with fine which may extend to Rs. 25.

14. *Penalty for neglect or failure to comply with notice under section 7 or 11.*—Whoever neglects or fails to comply with a notice served in accordance with section 7 or 11 shall, on conviction, be punishable with fine which may extend to Rs. 25.

15. *Penalty for neglect or failure to comply with requisition under section 10 or 12.*—Whoever neglects or fails to submit a bull for inspection when required by a live-stock officer for inspection under section 10 or whoever fails to produce a licence when required to do so in accordance with the provisions of section 12 shall, on conviction, be punishable with fine which may extend to Rs. 25.

16. *Power of live-stock officer to castrate.*—(f) Whenever an offence under section 15 has been committed, or whenever any bull has not been castrated in compliance with the notice served under section 11, it shall be competent to a live-stock officer to castrate or cause to be castrated in the prescribed manner, the bull in respect of which such offence was committed or such notice was served, as the case may be. Such castration shall be performed or caused to be performed by a live-stock officer free of charge.

(2) It shall also be competent to a live-stock officer to seize any bull, if the person in whose ownership, possession or custody it is, for the time being, is not known or cannot be ascertained after an inquiry in the prescribed manner. On such seizure the live-stock officer may, if he is of opinion that such bull has attained the prescribed age or is suffering from any of the defects or disease specified in section 7, direct that the said bull shall be—

(a) castrated in the prescribed manner, and

(b) sold by public auction or sent to a pinjrapol, provided that if the owner of the said bull appears within fifteen days of such seizure and proves to the satisfaction of the live-stock officer that the said bull is of his ownership,—

the said bull—

(i) if not sold by public auction, or

(ii) if sent to a pinjrapol,

shall be delivered to such owner on payment of the costs, charges and expenses incurred for the maintenance of the said bull and determined in the prescribed manner, or

(iii) if sold by public auction, the proceeds of such sale shall be paid to such owner after deducting therefrom the costs, charges and expenses incurred for the maintenance and sale of the said bull and determined in the prescribed manner.

17. *Power of live-stock officer to inspect or mark a bull or to enter premises.*—For the purposes of this Act, a live-stock officer shall have power at all reasonable times—

(a) to inspect any bull,

(b) to mark any bull with any prescribed mark in the prescribed manner,

(c) to enter any premises or other place in the prescribed manner where he has reason to believe that a bull is kept.

18. *Officers bound to assist live-stock officers.*—All village officers, all village servants useful to Government and all officers of the departments of revenue, agriculture and veterinary shall be bound—

- (a) to give immediate information to a live-stock officer of the commission of any offence, or the intention or preparation to commit any offence punishable under this Act which may come to their knowledge;
- (b) to take all reasonable measures in their power to prevent the commission of any such offence which they know or have reason to believe is about to be committed; and
- (c) to assist any live-stock officer in carrying out the provisions of this Act.

19. *Cognizance of offences under the Act.*—No Court shall take cognizance of any offence under this Act, except on a complaint made by a live-stock officer or any person authorised by such officer in that behalf.

20. *Live-stock officer to be public servant.*—Every live-stock officer shall be deemed of 1860. to be a public servant within the meaning of section 21 of the Indian Penal Code.

21. *Protection of persons acting in good faith and limitation of suits and prosecutions.*—(1) No suit, prosecution or other legal proceedings shall be instituted against any person for anything which is in good faith done or intended to be done under this Act or the rules.

(2) No suit shall be instituted against Government and no prosecution or suit shall lie against any live-stock officer in respect of anything done or alleged to have been done, in pursuance of this Act, unless the suit or prosecution has been instituted within four months from the date of the act complained of.

22. *Revision.*—Government may call for and examine the record of any order or the proceedings of any live-stock officer for the purpose of satisfying themselves as to the legality and propriety of any order passed and as to the regularity of the proceedings of such officer. If in any case it shall appear to Government that any order or proceedings so called for should be modified, annulled or reversed, they may pass such order as they may deem fit.

23. *Power of Government to make rules.*—(1) Government may make rules for the purpose of carrying into effect the provisions of this Act.

(2) In particular and without prejudice to the generality of the foregoing provision such rules may be made for all or any of the following purposes, namely:—

- (a) under section 4, prescribing the powers and duties to be exercised and performed by a live-stock officer and the assignment of such powers or duties,
- (b) under section 5, prescribing the age of a bull after which it shall not be kept without a licence,
- (c) under section 6, prescribing the form of, the manner in which the terms, conditions and restrictions on which, a licence shall be granted, transferred or renewed,
- (d) under section 7, prescribing the conditions subject to which a licence may be revoked,
- (e) under sections 7 and 11, prescribing the manner in which notice shall be served,
- (f) under section 8, prescribing the conditions subject to which a duplicate of a licence may be granted,
- (g) under sections 11 and 16, prescribing the manner in which a bull shall be castrated, and the manner in which inquiry regarding the ownership of a bull shall be made, and the costs, charges and expenses for the maintenance and sale of a bull shall be determined,
- (h) under section 17, prescribing the manner and form in which a bull shall be marked and the manner in which a live-stock officer shall enter any premises or other place.

(3) Rules made under this section shall be subject to the condition of previous publication in the *Bombay Government Gazette*.

(4) Rules made under this section shall be laid upon the table of the Bombay Legislative Council at the session of the said Council next following and shall be liable to be modified or rescinded by a resolution of the said Council and such rule shall after notification in the *Bombay Government Gazette* be deemed to have been modified or rescinded accordingly:

Provided that when, in the opinion of Government such modification or rescission is likely to defeat or frustrate any of the purposes of this Act, Government may, by notification in the *Bombay Government Gazette*, declare that the modification or rescission shall have no effect and thereupon the rule shall remain in force as if it had not been modified or rescinded.

24. *Power of Government to apply the provisions of this Act to buffalo-bulls.*—Government may, by notification in the *Bombay Government Gazette*, direct that all or any of the provisions of this Act which shall have been extended to any village under section 2 shall apply to buffalo-bulls in such village from the date specified in such notification and thereupon the references to bulls and cows in the provisions of this Act so applied shall be construed as references to buffalo-bulls and buffalo-cows respectively and this Act shall apply accordingly.

25. *Saving.*—Nothing in this Act shall apply to a bull dedicated in good faith to a religious purpose according to religious custom and usage.

REVENUE DEPARTMENT.

Bombay Castle, 19th September 1935.

No. 818/33.—In exercise of the powers conferred by section 23 of the Bombay Live-stock Improvement Act, 1933 (Dom. XXII of 1933), the Government of Bombay is pleased to make the following rules, namely:—

1. *Short title.*—These may be called the Bombay Live-stock Improvement Rules, 1935.

2. *Definitions.*—In these rules, unless there is anything repugnant in the subject or context—

- (i) "the Act" means the Bombay Live-stock Improvement Act, 1933;
- (ii) "castrate" means to perform an operation in accordance with these rules for the purpose of removing the reproductive power of a bull and the words "castrated" and "castration" shall be construed accordingly;
- (iii) "entire" means a male bull possessing full reproductive power;
- (iv) "schedule" means a schedule appended to these rules;
- (v) "section" means a section of the Act;
- (vi) "village" means a village to which the Act is extended and in which the Act has been brought into force under section 2;
- (vii) "panchayat" means a panchayat established under the Bombay Village Panchayats Act, 1933;
- (viii) words and expressions not defined in these rules but defined in the Act shall have the meaning assigned to them in the Act.

3. *Limit of age beyond which unlicensed or uncastrated bull not to be kept.*—No person shall keep a bull which has attained the age of two years unless a licence has been granted in respect of such bull, or such bull has been castrated in accordance with the provisions of these rules as the case may be.

4. *Application for licence.*—Where a person keeping a bull desires to retain such bull entire after it has attained the age of two years, such person shall, three months before the bull attains the age of two years, make an application for a licence in respect of such bull to the Live-stock Officer. The application shall state the name and address of the person who keeps such bull, the place where such bull is kept and the marks, colour, height and other particulars of identification of such bull.

5. *Inspection of bull before grant of licence.*—On the receipt of such application, the Live-stock Officer shall inspect the bull and if the Live-stock Officer is not a qualified veterinary officer, may cause the bull to be inspected by a qualified veterinary officer as to its age and whether it is suffering from any defect or is affected with any disease mentioned in section 7 (1) (b) and (c).

6. *Grant of licence.*—If on inspection under rule 5, the Live-stock Officer is satisfied that the bull is not suffering from any defect or is not affected with any disease mentioned in section 7, the Live-stock Officer may grant a licence in respect of such bull in the form prescribed in Schedule II; and the Live-stock Officer shall ordinarily grant a licence for any such bull so as to provide that there shall be one such bull for every 60 cows in a village in the Presidency of Bombay excluding Sind and for every 40 cows in a village in Sind.

7. *Period of licence.*—The period for which a licence may be granted shall not exceed three years.

8. *Marking of licensed bulls.*—A bull in respect of which a licence has been granted shall be marked by means of tattooing in such manner as the Director of Agriculture may from time to time direct.

9. *Inspection by veterinary officer when compulsory.*—Before refusing to grant or revoking a licence in respect of a bull on any of the grounds specified in sub-section (1) of section 7, the Live-stock Officer, if he is not a qualified veterinary officer, shall, if so required by the person who keeps the bull, cause the bull to be inspected by a qualified veterinary officer free of charge, and the opinion of such veterinary officer shall be conclusive whether the bull is suffering from any defect or affected with any disease mentioned in section 7 (1) (b) and (c).

10. *Renewal of licence.*—Before the period of a licence in respect of a bull expires, the holder of such licence shall apply to the Live-stock Officer for the renewal thereof. On such application the Live-stock Officer may renew the licence for a period not exceeding three years, provided that he is satisfied that the bull in respect of which the licence has been granted is not suffering from any defect or is not affected with disease mentioned in section 7.

11. *Transfer of licence.*—The holder of a licence may, with the previous consent in writing of the Live-stock Officer, transfer the licence to any person who shall have become the keeper of the bull. On such transfer, the Live-stock Officer shall make an endorsement on the licence stating the name of the person to whom the licence is transferred and the date up to which the said licence shall be in force.

12. *Notice of revocation of licence.*—When a Live-stock Officer revokes a licence in respect of any bull, he shall give the keeper of the bull notice in the form prescribed in Schedule III.

13. *Form of notice of castration.*—The notice of castration under section 7 shall be given in the form prescribed in Schedule IV.

14. *Castration.*—(1) Every bull directed to be castrated under section 11 or section 16 shall be effectively sexed.

(2) If a Live-stock Officer, not being a qualified veterinary officer, is not satisfied with the castration of any bull, he may cause the castration to be performed again by a qualified veterinary officer free of charge.

15. *Manner of inquiry under section 16.*—Before seizing a bull under sub-section (2) of section 16, the Live-stock Officer shall cause an inquiry to be made as to the ownership of the bull by the panchayat of the village in which the bull is kept and, where no panchayat has been established for the village, by a committee consisting of the village officers and such other residents of the village, not exceeding three in number, as may be appointed by the Live-stock Officer in this behalf.

16. *Determination of costs of maintenance and sale of a bull.*—The amount of costs charges or expenses specified in sub-section (2) of section 16 shall be fixed by the Live-stock Officer :

Provided that if the owner or other person who keeps the bull disputes the amount so fixed, such amount shall be determined by the panchayat of the village, and, where no panchayat has been established, by a committee constituted in the manner prescribed in the preceding rule. The decision of the panchayat or the committee, as the case may be, shall be final.

17. *Duties of the Live-stock Officer.*—It shall be the duty of the Live-stock Officer to exercise all or any of the powers conferred on him under the Act or the rules for the purpose of carrying into effect the purposes of the Act; and, in particular, to provide that no bull which has attained the age of two years shall remain in any village unless a licence has been obtained in respect of such bull, or unless such bull has been castrated in the manner prescribed by these rules.

18. *Power of Live-stock Officer to enter premises.*—The Live-stock Officer shall have power to enter any premises or place where he has reason to believe that bulls are kept, between sunrise and sunset, for the purpose of performing any of the duties imposed on him by the Act or the rules :

Provided that the Live-stock Officer may before entering such premises or place give notice in writing to the owner or occupier of such premises or place in the form prescribed in Schedule I.

SCHEDULE I.

(See rule 18)

To A. B. , residing at

Whereas I have reason to believe that you have kept on your premises an entire bull bulls I hereby give you notice that I shall enter your premises on * place between † for the purpose of inspecting the said bull bulls; you are hereby warned to keep the bull bulls ready for inspection and not to remove the bull bulls on the aforesaid date from the premises place until it is they are inspected by me.

Dated this the _____ day of _____ 19 .

SCHEDULE II.

(See rule 6)

LICENCE TO KEEP A BULL.

Mr. _____ of _____ is hereby
Mrs. _____
Miss _____

granted a licence, subject to the provisions of the Bombay Live-stock Improvement S. No. _____ Tatto No. _____ Act, 1933 (Bom. XXII of 1933), and the Bombay Name, if any, of bull— _____ Live-stock Improvement Rules, 1935. conferring upon Age— _____ him the privilege of keeping the bull described in the Colour— _____ her margin, for breeding purposes, in the village of Height— _____ district _____, taluka _____, Marks— _____, both Other particulars— _____ days inclusive subject always to the terms, conditions and restrictions hereinafter mentioned, namely :—

- (1) The licence-holder shall inform the Live-stock Officer of any illness, defect or deformity which is likely to render the bull unsuitable for breeding purposes.
- (2) The licence-holder shall not be entitled to any compensation for revocation of the licence.
- (3) The licence-holder shall submit the bull for inspection whenever required by any Live-stock Officer to do so.
- (4) The licence-holder shall maintain the bull in good breeding condition to the satisfaction of the Live-stock Officer.
- (5) The licence-holder shall give benefit of the service of the bull to the cows of the village in which the bull is kept in preference to the cows of other villages.
- (6) The licence-holder shall give to the Live-stock Officer all information regarding the service rendered by the bull during the period of the licence.
- (7) The licence-holder shall give intimation to the Live-stock Officer when the licensed bull is sold or otherwise transferred.

Dated this the _____ day of _____ 19 .

(Signed)

Live-stock Officer.

N.B.—(a) This licence may be renewed on the keeper satisfying the Live-stock Officer that the bull continues to be a good breeder and has been maintained in good breeding condition.

(b) This licence will be revoked for breach of any of the terms or conditions thereof.

(*Here state date.)

(†Here state hours.)

SCHEDULE III.

(See rule 12)

To

A. B. , residing at

Whereas it has come to my notice that you keep a bull described in the margin

S. No. Tatto No.

Name, if any, of bull— in respect of which a licence was granted to you

Age—

Colour— on

Height—

Marks—

Other particulars—

And Whereas I am of the opinion that

A. the bull appears to be *

B. there has been a breach of the terms or conditions of the licence inasmuch
as †I have under section 7 of the Bombay Live-stock Improvement Act, 1933, revoked
the licence and I give you notice of the said revocation as required by sub-section
(4) of the said section 7.

Dated this the day of 19 .

(Signed)

Live-stock Officer.

N.B.—A or B should be scored out where necessary.

SCHEDULE IV.

(See rule 13)

To

A. B. , residing at

Whereas it has come to my notice that you ^{own} keep a bull described in the

Name, if any, of bull:

Description:

margin in respect of which a licence is not taken
refused
revoked ;
not renewedNow therefore in exercise of the powers conferred upon me by section 11 of the
Bombay Live-stock Improvement Act, 1933, I give you notice that the said bull shall
be castrated within one month from the date of the receipt of this notice and that
on your failure to do so you shall be liable to be punished under section 14 of the
said Act.

Date this the day of 19 .

(Signed) -

Live-stock Officer.

Note.—Castration shall be performed by officers of the Agricultural or Veterinary
Departments free of charge.By order of the Government of Bombay
(Transferred Departments),J. A. MADAN,
Secretary to Government.* [Here state the condition according to clause (a), (b), or (c), as the case may be,
sub-section (1) of section 7.]

† (Here describe the breach.)

APPENDIX XI.

NOTE ON SUBJECT No 13 BY COLONEL A. OLVER.

You are doubtless aware that the Viceroy by his appeal wishes to stimulate interest in the improvement of cattle throughout India.

The matter has been given wide publicity and Governors of provinces have been addressed demi-officially and their replies in addition to the discussions of the subject which has taken place, at meeting of the Standing Cattle Breeding Committee and the Advisory Board, have brought out a good deal of information as to the lines along which it is considered that the work should be developed.

There is marked unanimity of opinion that arrangements must in any case be made for the proper maintenance and utilisation of presented bulls, and it is generally agreed that some arrangements for giving monthly premia or subsidies for their maintenance may be necessary as in the case of bulls supplied by Government.

The great value of periodical fairs and shows and of the presentation of medals and sanads in fostering interest in pedigree stocks is also recognised, and it is agreed in most provinces that cattle improvement societies should be formed; the intention being that members of these societies should undertake the purchase and maintenance of a number of pedigree bulls for the benefit of the people.

That such societies could be valuable supplementary source from which funds for cattle improvement could be provided you will I think all agree and it is to be hoped that the formation of such societies will have the effect of stimulating and maintaining the interest of zemindars and others in the production of better stock.

The outstanding feature however has been that the response to the appeal has been so great that it has drawn attention to the necessity for making more provision for the production of pedigree bulls, since the Viceroy is very anxious that adequate measures shall be taken to effect general grading up of livestock throughout the country, and to provide for continuity, without which he realises that no lasting improvement can be expected.

He therefore wishes cattle improvement to be again discussed and the object of this note is to initiate such a discussion with a view to arriving at definite conclusions as to the most feasible way of ensuring systematic action all over India on a far more extensive scale than is at present the case. As he has himself stated, one of the most important steps is to raise a corps of pedigree stock in order to meet the present great lack of suitable stud bulls which is largely due to the fact that in the past provision for the production of such bulls has in most provinces and states been very inadequate.

That the supply of suitable bulls is inadequate is very clear and I submit that it can hardly be expected that the large numbers of registered sires which are needed could be produced without more adequate provision for organised Animal Husbandry that is at present made in most provinces.

It is also obvious that, to be effective, on the very broad scale which is needed, the organisation, charged with cattle improvement will have to be in a position to carry on year after year, throughout the country organised castration of inferior males and systematic inoculation of improved stock against contagious disease, along with official registration, periodical inspection and suitable marking of improved stock. Moreover it seems clear that in order at reasonable cost to carry on this work, much of which is purely veterinary, it will be necessary to make far greater use of the existing provincial veterinary departments or to employ special cattle breeding staff in large numbers; for example at the discussion of the subject by the Standing Cattle Breeding Committee it was agreed that it would be necessary to employ at least one cattle breeding inspector and necessary subordinate staff per 50 bulls.

This at once raises the most difficult question of all, namely whether such provision is feasible in present circumstances and whether all this work could not be more effectively and cheaply carried out if provincial veterinary and livestock improvement staff were amalgamated to form Provincial Animal Husbandry Departments under the control of Directors devoted solely to such work.

In this connection it is important to note that in the Punjab where all livestock work is dealt with by a department under such control, there are at present between 13,000 and 14,000 approved bulls at work under Government control—far more than in any other province—and that the records of the services of these bulls and of their progeny are maintained by the Veterinary Service without extra field staff.

Moreover by working on these lines, the Punjab has been able to develop livestock far more extensively than has been the case in provinces where this work has, for years past, been under the control of Directors of Agriculture assisted by specially employed livestock officers and some special staff. Yet in the Punjab the proportion of the total amount of money placed at the disposal of the Minister of agriculture allotted to disease control and livestock improvement combined, is no greater than the average for the whole of the rest of India, *viz.*, a little less than $\frac{1}{2}$ of the amount which is allotted for crops and soils, *vide* annexure A. In view of these figures and of the marked general improvement which has been effected in the cattle of that province it seems to me extremely difficult to avoid the conclusion that the system in operation in the Punjab is likely to be the cheapest and most effective way of obtaining the extensive improvement which is desired by the Viceroy.

What provision to make for the improvement of cattle and for carrying on indefinitely the work which has been started in answer to the Viceroy's appeal, are however provincial matters but the views of this meeting are invited on the following suggestions which have arisen out of the various discussions which have taken place with a view to give the fullest possible effect to his wishes, *viz.*—

- (1) That Provincial and State Cattle Breeding Societies should be formed.
- (2) That provision will have to be made for the bulls provided by provincial cattle breeding societies to be maintained out of the societies' funds. Otherwise these bulls will merely take the place of a corresponding number of Government bulls since the Department charged with cattle breeding would have funds only sufficient to maintain a definite number.
- (3) That the chairman and secretary of these committees should be Government officials preferably the Deputy Collector and a representative of the Animal Husbandry Departments and that such societies should appoint inspectors and staff at the rate of 1 inspector per 50 bulls in order to maintain accurate registers of all services and to carry on milk recording where this is necessary for the building up of high yielding strains of milch cattle whose owners agree to official recording.
- (4) That only cows giving over a certain fixed minimum yields in a lactation of 300 days would be registered and that this minimum should from time to time be fixed by the Cattle Breeding Committee of the Imperial Council of Agricultural Research for the whole of India and for particular breeds.
- (5) That only such progeny of suitable cows as are approved by the Provincial Animal Husbandry Departments should be registered as pure bred stock.
- (6) That legislation for the compulsory castration of all inferior males should be introduced.
- (7) That measures for the systematic improvement of cattle by controlled breeding should be taken up all over the country at first in areas where definite types exist and that subsequently selected bulls from these areas should be utilised for the improvement of the cattle in areas where at present there is no definite type.
- (8) That all Government farms should be developed to the fullest extent possible for the production of pure bred strains of the best indigenous breeds and that subsidies or some other inducement might be given to other farms and Pinjrapoles which would undertake to carry on pedigree breeding under official control and to induce them to rear at least the best of their male calves of pure Indian breeds as sires.
- (9) That a system should be developed under which bull owners charge service fees and thus to gradually do away with the present necessity for supplying funds for the maintenance of such bulls.
- (10) That vaccination against rinderpest should be given free of cost to all approved pedigree stock.
- (11) That provincial registration of the best local breeds should be carried on in addition to the central registration of seven of the best milch breeds which is now proposed.

Annex-

Statement showing staff employed and amount allotted.

Province.	Total Budget. Rs.	Veterinary Department.			Remarks.	Total Budget. Rs.	Agriculture	
		Total staff.	No. of staff financed by District Boards.	Allotment for Live-stock. Rs.			Allotment for Livestock.	
							Amount. Rs.	Per-centage of total.
1. Madras	9,68,000	24 G. 310 N. G.	Not known.	...	...	18,47,100	1,15,800	6.2
2. Bombay	3,78,000	8 G. 141 N. G.	None	...	...	12,29,000	91,000	7.4
3. Bengal	4,82,000	167	2/3 of cost of 116 V. A. S.'s recovered from District Board.	...	...	9,95,000	54,367*	5.4
4. Punjab	12,91,000	36 G. 405 N. G.	...	232,900	...	25,96,600	53,880	...
5. United Provinces.	4,36,000	5 G. 41 N. G.	182	...	...	23,62,800	1,20,738	5.1
6. Central Provinces.	3,86,000	166	...	...	...	9,00,000	95,020	10.5
7. Bihar	5,21,574	5 G. 168 N. G.	...	53,151	...	9,92,617	43,218	6.2
8. Assam	1,41,203	33	34	...	...	4,86,881	1,15,880	23.7
9. N.-W. F. P.	1,28,700	52	46	20,200	...	2,15,000	...	...
Total	...	...	...	...	...	...	...	...

* Taken from Provincial budgets (Revised Estimates for 1935-36). The rest of the G. = Gazetted N. G. = Non-

re A.

or live stock work, and live stock population in provinces.

Department.		Cattle.	Buffaloes.	Livestock population.			Mules Donkeys and Camels.	Total.
Strength of staff.	Remarks.			Sheep.	Goats.	Horses and Ponies.		
2 G. N. G. not known.	...	17,780,731	6,817,124	11,938,724	6,761,021	52,864	148,538	43,808,022
1 G. 10 N. G.	Excludes 5 clerks.	7,447,023	2,513,369	1,681,205	2,108,918	116,390	73,561	13,041,708
6	*Excludes T. A.	24,198,872	1,088,112	618,677	5,435,262	113,533	2,554	31,462,000
...	...	9,792,240	6,048,261	4,424,147	4,164,496	398,748	999,137	26,827,029
*1 G. 7 N. G.	Other Agri. staff also do livestock work.	23,177,336	9,292,216	2,068,750	7,932,007	506,031	311,080	43,280,010
1 G. 7 N. G.	...	11,050,361	2,193,667	427,853	1,765,016	145,565	40,725	10,223,187
1	...	17,634,800	3,673,580	1,233,220	5,545,322	104,145	32,729	28,313,296
1 G. 20 N. G.	...	5,448,070	532,901	37,588	757,268	10,930	241	6,790,658
...	...	799,824	237,902	431,620	474,271	21,494	147,786	2,172,897
...	...	...	...	...	...	...	...	211,404,767

Figures except population of livestock are supplied by Local Governments.
 staff.
 gazetted staff.

APPENDIX XII.

NOTE ON SUBJECT No. 14, BY E. J. BRUEN, LIVESTOCK EXPERT TO THE GOVERNMENT OF BOMBAY.

In India we have many distinct breeds or types of sheep, each evolved or bred by force of circumstance according to environments in which they are found to-day. As far as my knowledge goes and particularly in the Bombay Presidency, sheep breeding is conducted by a class of shepherd who attaches himself or has attached himself to a village. These shepherds own from 50 to 100 sheep per family. The industry is therefore more or less a cottage industry. The shepherd is not a landed proprietor and hence grazing is very meagre, depending entirely on the conditions prevailing. Hence there is a vast difference between the same breed of sheep even in adjacent villages, the difference being so marked as to make one believe the breed is different. The types or breeds maintained also depend largely on the kind and type of wool in demand, such as in certain areas country blanket weaving is conducted on a large scale as a cottage industry. The demand from such is a short staple black wool. The breeder has consequently bred to this demand. For Mills and export there exists a demand for a white wool of longer staple. This is met by breeding a better class of sheep under better conditions.

Generally speaking, the standard of the Indian sheep is very poor, having a small body covered very sparsely with an inferior wool. This poor standard is undoubtedly due to mal-nutrition and promiscuous in-breeding. It is doubtful if the shepherd ever gets new blood in the shape of a Ram. He uses his own stock continuously.

The Indian shepherd never castrates. He maintains all male stock until marketed for meat at a year or more of age. The male is of very little value to the shepherd, being more of a nuisance than it is worth. Consequently many shepherds leave behind their male calves born whilst away from their homes. In Gujarat some 18,000 male lambs are rescued annually by the Ahmedabad Pinjrapole from flocks of sheep visiting this province in search of grazing and fees for manuring land.

In the foregoing I have tried to describe the types of sheep and the reasons for their existing standards.

Another reason for the poor quality is the result of moving about on dusty roads for days and nights moving from pasture grounds to pasture grounds in search of food.

Now in starting on any scheme of improvement we must keep in mind the demands for wool and other products.

The first essential to improvement is the stamina and size of frame of all types. Then there is the wool carrying capacity, or the breeding of a type that will be better covered with wool, such as the bare abdomen and bare legs of our present sheep and generally a more dense covering of wool, thus producing a sheep which will yield a large quantity of useful saleable wool.

The above must naturally be cautiously introduced and the country or the area must be studied as it may be undesirable in areas with shear grass or burrs to have too much wool on the legs.

Having improved the frame and the wool carrying capacity which will give better returns, we must then proceed with improving the quality of the wool. By this I mean length of staple, sheen, and fineness of the wool.

Here again caution is essential. The village weaver will find it extremely difficult to handle the finer wools. The present methods of combing and carding are suited only to coarser wools.

We must study the demand for wool abroad and for our local Indian Mills. What type of Indian wool will be most popular. This type of investigation must be studied on Government Farms.

It is my opinion that the first step to improvement of this industry is the starting of farms. These farms to be located on that type of land on which the industry is now conducted. This will give us an idea as to how sheep land should be managed. The number of sheep in an acre of such land will carry and the type of sheep suited to such land.

2. Flocks of indigenous sheep to start with should be maintained. Improvement by better breeding and selection undertaken. It may be possible by better breeding and better land management to evolve a more profitable sheep.

To improve quality of wool, I feel it is essential to import a small flock of Merino Rams and Ewes. These imported sheep can be bred pure and also the Rams used on a small flock of indigenous sheep. We can then watch results of our work. A comparison made of the results of better breeding and management on the indigenous flock and the grade Merino country flock made. The method proving most economical eventually to be adopted.

The most suitable time or times for shearing, docking, castration, washing, if possible, etc., would be watched. Simultaneously with the improvement, we shall have to experiment with better methods of utilization of the better wool and better marketing methods will have to be evolved.

APPENDIX XIII

NOTE ON SUBJECT No. 15, by Mr. R. N. NAIK, G.B.V.O., VETERINARY INVESTIGATION OFFICER, BOMBAY PRESIDENCY.

Tick infestation is an everpresent menace to animal husbandry in India as it causes immense suffering to livestock and enormous economic loss to cattle owners.

Harmful effects caused by Ticks.

Ticks are comparatively large mites which infest the body surface and live exclusively by sucking blood. The quantity of blood extracted by each tick is frequently as much as 0.4 c.c. Animals harbour ticks, not only in thousands, but frequently in millions and when the infestation is so heavy the quantity of blood extracted can easily be imagined. Tick-bite wounds which frequently become infested with maggots are very common and sometimes act as a predisposing cause of mammitis and other diseases. They also afford a means of entrance to the organisms of Anthrax and Bovine lymphangitis (Bulletin No. 13, 1931, *Dep. of Agr., Kenya Colony*). Piroplasmosis and Theileriasis which are caused by protozoan diseases are very common in India and are transmitted by ticks (Cooper, H., 1926). Tick toxæmia is a serious condition attended with mortality and is caused by the injurious effects of the saliva injected by ticks when they suck blood (Naik, R. N., 1931).

Economic loss caused by Ticks.

The economic loss caused by ticks to the Indian cultivator is due to the following—

(i) *Loss of condition.*—Cattle heavily infested with ticks are reported to lose as much as 500 lbs., of blood in a year. In the United States of America, Department of Agriculture Bulletin No. 498, it was shown how an animal heavily infested with ticks and weighing 730 lbs. increased in weight to 1,015 lbs. in the course of two months when freed from ticks, the feed being the same throughout, thus showing a gain of 285 lbs. or a daily gain of 4½ lbs.

(ii) *Decreased milk yield.*—The United States of America, Department of Agriculture has further demonstrated that with a light tick infestation the milk yield of a cow was decreased by 1½ quarts causing a loss to the farmer of 3½d. daily, and with a heavy infestation the loss would amount to 3.4 quarts of 8½d. per day. In the latter case, the loss amounts to £6-9-0 or Rs. 86-1-0 per lactation period.

(iii) *Reduced working power.*—Cattle whose bodily strength and vitality are reduced as a result of tick infestation cannot give the same results in work as cattle in good condition.

(iv) *Damage to hides.*—The tick bite causes minute perforations in the hide and the value of the hide is consequently reduced to a certain extent. In Western Countries tick bitten hides are valued at 1½d. per lb. less than uninjured hides.

(v) *Decreased fecundity.*—Owing to the constant drain of blood, the cow frequently fails to come into regular oestrus. It is not uncommon to find lean cows remaining sterile for a year or two.

(vi) *Higher mortality rate.*—It has been recorded (Naik, R. N. 1931) that the death rate in cattle in tick infested areas is much higher than in areas comparatively free from ticks. In the United States of America, it has been calculated that in tick infested areas the death rate among cattle is three times greater than in tick free areas. It has been found in the Bombay Presidency that in the heavily infested tracts the mortality due to tick ranges from 3 per cent. to 8 per cent. or more of the cattle population and that this mortality usually occurs during the monsoon season.

(vii) *Stunted growth.*—This is one of the most evident results of tick infestation as ticks attack cattle from early calfhood. The body cells are deprived of sufficient nourishment for natural development and as a result the body growth is slow, the cattle are stunted and maturity is delayed by at least two years.

(vii) *Predisposition to other diseases.*—By reducing the vitality ticks, like internal parasites, render the host more liable to contract the various contagious diseases or to suffer from constitutional disturbances and less able to withstand the rigours of the monsoon season.

(ix) *Decrease in value.*—In the United States of America, Department of Agriculture, Circular No. 198, dated 8th February 1912, it was stated that the average value of a three-year old steer before tick eradication work was started was 16.15 dollars and that after eradication, it increased to 23.25 dollars.

A conservative estimate of the loss caused in these ways would amount to approximately 20 per cent. of the value of cattle. Even if one estimates the loss at 10 per cent. the loss sustained by a village having 1,000 head of cattle, valued on the average at Rs. 30 each, would amount to Rs. 30,000. The total cattle population of India is, according to the latest census, more than 315 millions and therefore the annual loss caused by ticks will amount to about 9½ crores. This is a colossal amount and is entirely borne by cultivators whose annual income is only about Rs. 40.

Distribution and Bionomics of Ticks.

Ticks are prevalent all over India irrespective of altitude and extreme of humidity and temperature. Recently Sharif M. (1928) recorded 9 genera, 45 species, 4 sub-species and 6 varieties of ticks in India, a list of which is given in Appendix I. These are mainly divided into two groups, continuous feeders and intermittent feeders, the grouping being based on the feeding habits of the ticks. They are very prolific, each fecundated tick laying from 2,000 to 5,000 eggs and some species may lay as many as 20,000. From these eggs larvae are hatched which undergo two moults and then become sexually mature adults. The continuous feeders finish their life cycle in about two months and the intermittent feeders in about six months. In the larval or nymph stage they can withstand starvation for from 6 to 7 months and adults for 14 months or more. As a result, they have gained a very strong foothold in this country and are sometimes even found in human habitations. During the optimum season, one will find cattle literally covered with them.

Native Remedies.

Enquiries made in various parts of the Bombay Presidency show that the cattle owners are fully alive to the harmful effects from these parasites. It has been noticed that they spend considerable time and money on country remedies which ordinarily consist of:—

- (i) The application of some bitter oil.
- (ii) The application of the decoction of some astringent plant.
- (iii) Standing the animals out in the open at night.
- (iv) Sorcery and the placing in the cattle shed of charms prepared at the time of the new or full moon or at the time of an eclipse.

These native remedies do not give any substantial relief to the cattle as they are not poisonous to the tick. Sometimes the application of the remedy or the hanging up of a charm in the cattle shed coincides with the end of one of the stages in the life of the tick at which time intermittent feeders naturally fall down for moulting, and there is an apparent reduction in their numbers which is attributed to the treatment, but when reinfestation occurs the owners are bitterly disappointed. They consider that this infestation causes greater losses than rinderpest, for while ticks are always present, rinderpest occurs only once in three to five years.

Modern Methods of Cure and Prevention.

There are three ways of treating tick infested cattle, viz., removing the ticks by hand, the soiling method and the application of medicinal solutions. The first method is not possible when the ticks are present in very great numbers and even when the greatest care is taken, it is rarely possible to remove them without leaving the proboscis in the skin. The soiling method requires a large area divided into a series of enclosures. The cattle are transferred from enclosure to enclosure until all the ticks have fallen, either to moult or to lay eggs, and are then left to die of starvation. In view of Indian conditions, such a procedure is not possible and the only remaining method is therefore the application of medicinal solutions. Although a large number of such solutions are available, only those having arsenic as the principal ingredient have been found really effective. On account of the presence of arsenic, the solution is usually used in the form of a dip or spray at a specified place in order to avoid soiling the pastures or much handling of the

animals by attendants. For the rapid and convenient treatment of large herds, special dipping tanks have been used in the United States of America, Australia and South Africa for the past 25 years and it is understood that such dipping has largely succeeded in controlling ticks in those countries.

Having freed cattle from ticks, there are two ways of keeping them free; (i) by housing the clean animals in tick proof shed and allowing them to graze on tick free pastures only and (ii) by regular dipping or spraying with large machines invented for the purpose. The former method is not possible in India as the average Indian cultivator is a poor man and cannot afford to construct tick proof cattle shed and does not own sufficient land. Regular dipping or spraying only is therefore available. As a result of regular dipping any ticks which becomes attached to the cattle will be killed or effectually sterilised and if the process is kept up regularly, no ticks will eventually be available for breeding purposes. It would, therefore, appear that the best method of cure and prevention is dipping in arsenic solution. In the United States of America, where dipping is carried out under legislation, it has been reported that from an area of 728,566 square miles, complete eradication of ticks was effected in 527, 781 square miles. In India such dipping tanks have only been introduced in a few Military Dairies and other Government Institutions and they are reported to have proved very effective. It is, therefore, necessary that they should be introduced in the rural India in order to minimise the economic loss resulting to the livestock owners and to encourage profitable animal husbandry.

Dipping Tanks.

The dipping tanks which are in use in the United States of America, Australia and the Union of South Africa are identical in design except in minor details. A dipping plant is usually constructed in such a manner that the animals are placed into pens from which they are driven through a chute to the take-off, which is either vertical or has a slide. From here the animals either jump or slide into the dipping tank which is sufficiently long and deep to allow them to swim through the dipping fluid without sustaining any injuries and emerge at the other end by walking up a gradual incline provided with cross strips or steps. From here they pass into the dripping pen, where they are sometimes rubbed down and then placed into a drying pen. In this whole plant, the design of the tank proper is very important as it should ensure complete immersion of every animal dipped precluding all risks of injury. Other structures above ground may be constructed according to what one can afford. Dimensions of different models of dipping tank are given below along with that of the one proposed for introduction in India :—

Model.	Dipping tank.							'Total length.
	Take off.		Length of tank proper.	Length of gradual incline.	Depth.	Width.		
	Length.	Sliding depth.				Bottom.	Top.	
1. Illustrated by Messrs. Cooper, McDougal and Robertson, Ltd., London in their booklet "Cattle Dipping Bath".	5' 0"	sliding 3' 0"	20' 0"	30' 0"	6' 0"	2' 0"	4' 0"	55' 0"
2. Rhodesian Model. Illustrated in the Tropical Veterinary Bulletin, Vol. VII, 184.	Sudden drop		16' 3"	18' 3"	6' 0"	2' 3"	4' 0"	34' 5"
3. American Model, after Graybill. Illustrated in Hutyra and Marek, Vol. I, p 969 (Edition 1936).	2' 0"	sliding 2' 0"	12' 4"	12' 0"	5' 3"	1' 7"	3' 0"	20' 4"
4. Proposed for introduction in India. Illustration attached.	2' 0"	sliding 2' 0"	10' 0"	14' 0"	6' 0"	2' 0"	4' 0"	26' 0"

The cost of constructing the tank (together with the elaborate wooden structure above ground) mentioned in item No. I above amounts to Rs. 3,082 according to the estimates supplied by the Executive Engineer, Dharwar. On account of the prohibitive cost of his model, a cheaper one designed on the lines of the American Model said in item No. 3 above was obtained specially prepared through the courtesy of the Concrete Association of India. It is estimated to cost Rs. 650 (*vide* Appendices Nos. II and III). With a view to give a trial to this model one dipping vat was obtained constructed at the Cattle Breeding Farm, Betegaon, which is managed by the Bombay Gowrakshak Mandali and His Excellency Sir Frederick Sykes, the then Governor of Bombay, performed its opening ceremony on 28th November 1933. It has been put into use since then with quite satisfactory results. The animals have been found to plunge themselves into the vat completely immersing their head and to pass through it with ease. There were no mishaps up-to-now. The tick infestation too has been kept under control thus showing the practical value of the model. It is, therefore, recommended to give a trial to this model at this early stage of introducing cattle dips in India. The estimates given may slightly vary at different places according to local conditions. If one chooses to construct it with locally available materials such as hard-burnt bricks or smooth cut stones with cement plastering instead of Reinforced Concrete the cost may be less than these estimates.

In passing it may be stated here that a scheme for the control of ticks prepared by me under the guidance of Mr. E. S. Farbrother, M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay Presidency, has been recently sanctioned by the Imperial Council of Agricultural Research, Delhi. According to this scheme it is proposed to conduct extensive experiments with different proprietary and home-made arsenic dips with the object of collecting data on the value of dipping and spraying operations under the rural conditions differing in climate and in the intensity of tick infestation.

The cultivators of India are still ignorant of the modern methods of cure and prevention against ticks and I, therefore, submit the following for consideration :—

1. Intensive propaganda may be undertaken to popularise dipping and spraying operations against ticks.
2. Where village up-lift committees are organised dipping tanks may be introduced giving a grant from the funds allotted under the village up-lift scheme.
3. In the villages where tick infestation is heavy dipping tanks may be introduced preferably by organising co-operative dipping society with grants-in-aid from the Government and Local Bodies.
4. Tick infestation is a subject of great importance in all the civilised foreign countries lying in the tropical and sub-tropical region. In the United States of America legislation has been enacted to secure complete eradication of ticks and in the Tanganyika Territory a special staff numbering about 28 per cent., of the field staff are employed to supervise dipping operations. It is, therefore, suggested that this problem may be tackled in India at least on the lines adopted in the Union of South Africa.

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APPENDIX No. I.

List of ticks found in India, Burma, Ceylon, the Andamans and Nicobars.
GENUS :—*Ixodes*.

Species :—*Holocyclus*.
Ricinus.
Acutitarsus.
Granulatus.

GENUS :—*Haemaphysalis*.

Species :—*Turturis*.
Hystericis.
Birmanias.
Montgomeryi.
Cornigera forma typica.
Cornigera var. anomala.
Spinigera.
Flava.
Aculeata.
Cuspidata.
Bispinosa forma typica.
Bispinosa var. intermedia.
Parva.
Formosensis.
Leachi forma typica.
Leachi var. indica.
Wellingtoni.
Howletti.
Campanulata.
Inermis var. aponommoides.
Kinneari.
Sewelli.
Sundrai.
Choprai.

GENUS :—*Aponomma*.

Species :—*Pattoni*.
Gervaisi forma typica.
Gervaisi var. lucasi.
Laeve.
Trimaculatum.

GENUS :—*Nosomma*.

Species :—*Nosomma monstrosum*.

GENUS :—*Dermacentor*.

Species :—*Auratus*.
Feni.
Longipes.
Indicus (*Amphyomma* ^{*sulita* *re*} *Neum. O.*)

GENUS :—*Boophilus*.

Species :—*Australis*.
Annulatus subsp. calcaratus.

GENUS :—*Rhipicephalus*.

Species :—*Sanguineus*.
Haemaphysaloides.

GENUS :—*Hyalomma*.

Species :—*Syriacum*.
Aegyptium subsp. afromedarii.
Aegyptium subsp. israci.
Aegyptium subsp. ferozedini.
Aegyptium forma typica.

GENUS :—*Hyolomina*.

Species :—*Hussaini*.
Hussaini var. *brevipunctata*.
Kumari.

GENUS :—*Amblyomma*.

Species :—*Olypeolatum*.
Itegrum.
Supinoi.
Nitidum.
Sublaeve.
Helvolum.
Testudinarium.

APPENDIX II.

Estimates for the Cattle Dipping Vat.

Item.	Quantity.	Rates.	Unit.	Amount.
		Rs. A. P.		Rs. A. P.
Excavation	850 c. ft.	1 0 0	% c. ft.	8 0 0
2. 4" Plain Concrete Flooring .	145 s. ft.	35 0 0	% s. ft.	50 12 0
3. 4" R. C. Flooring	75 s. ft.	50 0 0	% s. ft.	37 8 0
4. 6" R. C. Walls	325 s. ft.	100 0 0	% s. ft.	325 0 0
5. Sills	15 r. ft.	..	..	3 0 0
6. Concrete posts including foundations.	25.0 c. ft.	2 0 0	c. ft.	50 0 0
7. G. I. Railing	150 r. ft.	16 0 0	% r. ft.	24 0 0
8. Drains, soak pit, etc. . . . .	..	..	..	25 0 0
9. Gate	30 s. ft.	1 4 0	s. ft.	37 8 0
Contingencies 5 % . . . . .	..	..	..	28 0 0
		Cost without roof total .		588 12 0
		Roof.		
Cost . . . . .	..	..	..	588 12 0
No Frango or curved cement Asbestos sheets.	245 s. ft.	12 0 0	% s. ft.	29 6 0
Steel for above	3.8 cwt.	7 8 0	cwt.	28 8 0
Contingencies . . . . .	..	..	..	2 4 0
		Cost with roof Total .		648 14 0
		Say Rs. 650 0 0		

In this estimates A types posts and wooden posts have been replaced by 5" x 5" concrete posts and wooden railing by G. I. pipes.

APPENDIX III.

Specifications for Cattle Dipping Vat.

Excavation shall be done to the required dimensions given in the drawing. The ground below the floor slab should be well rammed.

Flooring.—The floor at the entrance and of the dripping pen will be of 4" plain cement concrete laid on well consolidated ground. Proportion of concrete mix will be 1 : 2 : 4, with 6 gallons of water per bag of cement. Coarse aggregates—to consist of hard and durable broken stone which must be clean, free from clay and other organic impurities and be well graded from 1" downwards.

Concrete shall be laid in one course 4" thick and finished with little rough surface.

The floor of the bath and the incline at the exit to be of reinforced concrete 4" thick, reinforced with $\frac{1}{2}$ " bars at 6" centres, which reinforcement should be continued in the walls on both sides.

Walls.—Walls to be reinforced cement concrete 6" thick, of section shown in the drawing, the walls projecting at least 1 foot ground level—proportion same as in floor reinforcement $\frac{1}{2}$ " bars at 6" centres to a height of 6 feet from bottom and for the rest of the height $\frac{1}{2}$ " bars at 12" centres. $\frac{1}{4}$ " distributing bars at 12" centres will be used in floors and walls.

After the walls and floor have been laid in concrete it shall be plastered smooth with 1 : 2 cement mortar, except the incline which shall be finished as shown in the drawing.

In the bath, drain leading to a soak pit should be provided at A.

Roof.—The roof will be of No Frango or curved cement Asbestos sheets.

Flat steel bars bent to the required shape should be embedded in concrete walls at every 3 feet centres to support the roof.

At the entrance these bars should be bolted on to the precast R. C. Posts for which holes should be provided.

R. C. Posts.—These posts 14 in number will be precast in moulds 5" x 5" and 7' long, of which 1' 6" will be embedded in the ground. Each of these should be provided with holes for $3\frac{1}{2}$ G. I. Pipe Railing.

Concrete sills shall be provided at the junction of the bath and dripping pen with drain holes in position shown

Sill shall also be provided at the entrance.

Soak pit will consist of a well 3' diameter and 4' deep, its level being below the drain pipe filled with either brick-bats or other porous material.

APPENDIX XIV.

NOTE ON SUBJECT NO. 16, BY MR. P. N. NANDA, M.R.C.V.S., SUPERINTENDENT, CIVIL VETERINARY DEPARTMENT, NORTH PUNJAB CIRCLE, RAWALPINDI.

I. BRANDING

(a) BRANDING ON THE BODY

This method of marking with hot iron, for purposes of identification has been in vogue for hundreds of years in this country. Animals are generally branded on their hind quarters. In villages, the branding iron is given a distinct shape or mark, according to the whim of the owner, such as a circle or a cross. In some of the cattle breeding farms, however, where branding is practised as a routine, a definite system is followed which enables the authorities concerned to establish the identity of each individual animal. For instance, at the Government Cattle Farm, Hissar, all animals including cattle, horses, donkeys, camels, mules are branded. In the case of cattle, each animal carries the serial number on the one side and the other side shows the quarter and the year of birth of the animal. For example, if an animal shows 123 on the left side and 3 6 on the right, it would be interpreted to mean that the particular animal's serial number was 123 and that it was born in the third quarter of the year 1926 or 1936. The appearance of the animal, however, gives a ready clue as to the exact year of birth.

The technique is fairly simple, when one gets to know by experience, the degree of heat, the amount of pressure and the duration of contact required. A number of men are trained at the Government Cattle Farm, Hissar, every year within a few days. Immediately after branding the numbers are smeared with a little carbolic oil and generally no other after treatment is required.

Advantages

- (i) The technique is simple.
- (ii) The branded numbers or marks are permanent.
- (iii) The marks are quite legible from a distance and there is, therefore, no necessity of handling an animal to establish its identity. This is the most striking feature and branding is, therefore, an ideal system on farms where cattle are bred on the ranch system.

Disadvantages

- (i) The branded numbers disfigure the body and certain purchasers do not like to acquire branded animals.
- (ii) A permanent blemish is left on the hide, thus reducing its market value.
- (iii) In certain parts of the country, branding is objected to on religious grounds.

(b) BRANDING ON THE HOOF

This method of marking is generally practised on horses and mules chiefly in the Army. The main disadvantage is that the marks are not permanent. The system, therefore, does not merit any special consideration.

II. TATTOOING

Tattooing of animals for purposes of identification, though of a comparatively recent origin, has already gained enormous popularity and is being widely practised in different countries of the world.

TECHNIQUE

The technique is simple but requires patience and perseverance. It has been fully dealt with by the author of this paper in an article on this subject which appeared in the *Agriculture and Live-stock in India*, Volume VI, Part II, March 1936.

Advantages.

This system of marking has the following advantages :—

- (i) The operation is simple and painless.
- (ii) It is safe and humane.
- (iii) It is inexpensive and convenient
- (iv) The marks are permanent and legible.
- (v) There is no disfiguring or mutilation.
- (vi) Figures and letters in various combinations can be used so that regardless of the size of the herd or number of animals, each individual can be allotted its own mark of identification for permanent record.

TATTOOING IN THE PUNJAB

Tattooing of cattle as a protection against cattle lifting is to be adopted on a large scale in this province, in the near future. This system of identification will be further extended by the introduction of His Excellency the Viceroy's Bull Scheme. Following progress has been made in this connection :—

- (a) In consultation with the Police and Civil Veterinary Department, Punjab, F. L. Brayne, Esquire, Commissioner, Rural Reconstruction, has prepared a tattooing scheme which is attached as Appendix A.
- (b) Instructions have been issued by the Director, Veterinary Services, Punjab, Lahore, to all Circle Superintendents who have been asked to see that the existing subordinate veterinary staff working under them is fully conversant with the technique of tattooing animals so that the registered tattooers in each hospital ilaga can be adequately trained and tattooing of cattle under H. E. the Viceroy's Scheme is efficiently carried out.
- (c) Training of the new veterinary graduates will not be necessary in future, as the use of tattooing forceps has been included in the Punjab Veterinary College syllabus since 1934-35.
- (d) Arrangements are being made to supply forceps and ink to all hospitals in the province. It has also been laid down that these will in future be considered as an essential item in the equipment of all new hospitals.
- (e) Cattle stocks for the handling of animals while being tattooed are also being put up in the veterinary hospitals. In future these would form an essential part to be included in the standard plan hospital buildings.
- (f) A standardised code of cattle description has been drawn up by the author for this province, and is attached as Appendix B.

CONCLUSIONS.

Branding of animals with hot iron on the body is a useful system of identification. It is an ideal method where cattle are bred and reared on the ranch system. It has, however, a limited scope of application in the villages at large. Tattooing on the other hand, presents a wider field, and is capable of universal adoption in this country.

APPENDIX A.

TATTOOING OF CATTLE.

Cattle lifting is a nuisance from all points of view and its elimination is an important item of rural reconstruction. Experience has proved that although it has its defects, the ear-marking of cattle by tattooing gives very great assistance in the discouragement of cattle stealing.

Machines and ink have been devised which are cheap to buy and easy to operate and will, if used properly and the ink thoroughly rubbed into the ear, leave permanent and distinguishable marks.

The following scheme has been drawn up in consultation with the Police and Veterinary Departments :—

1. Selected landowners and other suitable persons, co-operative societies, panchayats and other organisations, Estates of the Court of Wards, etc., will, subject to the approval of the responsible authorities, be encouraged to tattoo the ears of their cattle.

In the left or near ear of each animal will be the marks of the thana and of the individual tattooer. Every thana in the Punjab has been given a cypher, as you will see from the copy of special supplement No. 5 to the Criminal Intelligence Gazette dated the 6th November, 1935 (attached).

2. The cypher of the village, estate, society or other registered tattooer will be one of 24 symbols selected from the English alphabet and numerals. These will be used singly and consecutively for each thana until the series has been exhausted. These symbols will then be used in pairs. When this point is reached of course a four symbol punch costing a little more will be required for the near ear.

3. In the right or off ear of each animal will be marked the quarter of the year in which the operation is performed, e.g., 136 means first quarter of 1936, 437 means last quarter of 1937 and so on. This will give an adequate approximation of the date when an animal is tattooed and combined with the other marks will it is hoped be ample for purposes of identification.

4. It is recommended that special attention be paid to young stock as they are much easier to mark, although doubtless, careful owners will insist on doing all valuable beasts and all beasts which they intend to keep and not pass on as soon as they have no immediate need for them.

5. Punches and symbols are on their way from England.

6. Punches, ink and symbols will not be issued free. The scheme must be self-supporting from the start except for the assistance which Government, as explained hereafter, will afford. Prices are for the present as follows :—

Forceps	Rs. 25 each.
Alphabetical letters and figures	Anna 1 each.
Boxes	Rs. 2-8-0 each.
Ink	Rs. 2 each.

7. The maintenance of registers of all tattooed cattle will not be insisted on, although of course this will add enormously to the value of the system, and those to whom punches are sold should be strongly encouraged to keep proper registers. These will be supplied on application at Rs. 1-12 each.

8. Registers are in triplicate and each animal, as it is tattooed should be entered on all three parts of the form. When any animal dies or is transferred to another owner the fact must be entered on all three parts over the dated signature of the registered tattooer. In the case of transfer one counterfoil must then be handed to the transferee with a receipt for the price recorded in the proper column and the other sent to the thana. When a tattooed animal strays or is stolen the fact must

be immediately reported to the thana. Anyone acquiring a tattooed animal from a registered tattooer must obviously insist on getting his counterfoil or, if the tattooer does not keep registers, a proper written record of the transaction. Beyond the first change of ownership the tattooing system is not concerned, although possibly the tattoo marks will even then be of some value in preventing theft and in assisting identification.

9. Application to join the scheme must be made to the local Superintendent of Police, who, if he approves, will allot a number and give a certificate to the applicant which he will forward to me for provision of punches, symbols, ink and register, if he so desires. These will be forwarded V. P. P. unless the applicant makes other satisfactory arrangements for payment.
10. Punches and symbols will be provided on the distinct understanding that the Superintendent of Police of the tattooer's district, if he considers it necessary, to protect the scheme from abuse, etc., may confiscate them without dispute or question. Their present value will be refunded by me on receipt of punches and symbols in my office. Before giving the applicant a certificate enabling him to apply to me for punches, the Superintendent of Police will see that a properly attested agreement to this effect has been lodged in his office.
11. The Civil Veterinary Department will arrange to teach any registered tattooer how to use the forceps and ink and will from time to time give any reasonable assistance required. C. V. D. is also being asked to draw up, if not already done, and issue a standardised code of cattle descriptions so that tattooers may be able to enter in their registers an accurate identification which will be understood wherever the animal may later on be found. For efficient work stocks are invaluable. Plans of these can be got from the Civil Veterinary Department.
12. Both C. V. D. and Police will give reasonable help and advice but it must be clearly realized from the start that the payment, tattooing, recording and everything else has all got to be done by the registered tattooer himself. It is past high time for the big zamindar and organized villager to get on with the improvement of village condition—and the elimination of cattle stealing is definitely a bit of this work—instead of expecting Government to spoon-feed them for ever. It is for this reason that we are beginning with the educated, the well-to-do, and the organised. When they have toed the line it will be time enough to see what, if any, help and encouragement is required for the poor and the unorganised.

F. L. BRAYNE,

Commissioner,

Rural Reconstruction, Punjab.

The 26th October 1936.

APPENDIX B.

DRAFT STANDARD CODE OF DESCRIPTION OF CATTLE.

1. Sex

It should be specified as under :—

- | | | |
|------------------|---|--|
| (i) 'Bull' | . | An entire animal with two or more permanent teeth. |
| (ii) 'Bull Calf' | . | Entire animal with all milk teeth. |
| (iii) 'Bullock' | . | Castrated produce. |
| (iv) 'Cow' | . | Female animal which has already produced a calf. |
| (v) 'Heifer' | . | Female animal which has not produced a calf yet. |

2. Age

The following should be recognised :—

	Male.	Female.
(i) All milk teeth	'Khira'	'Khiri'.
(ii) 2 permanent teeth	'Donda'	'Dondi'.
(iii) 4 permanent teeth	'Chauga'	'Chaugi'.
(iv) 6 permanent teeth	'Chhigga'	'Chhiggi'.
(v) 8 permanent teeth	'Jawan'	'Jawan'.
	('Pura')	('Puri').

3. Breeds

The following pure breeds are recognised in the province. All other animals should be classed as of "mixed breed", if they do not come under any distinct breed mentioned below :—

Terms used in Vernacular—

Hissar,
 Haryana,
 Malwa,
 Montgomery,
 Dhanni, and
 Dajal.

4. Colour

The following distinctions should be made :—

- | | |
|---|--|
| White | As in Haryana and Dajal cattle. |
| Light grey | As in Malwa and Hissar cattle. |
| Dark grey | As in Hissar cattle. |
| Black | (Distinct colour, needs no description). |
| Red | As in Montgomery or cattle of mixed breeds. |
| Black and white | As in Dhanni or cattle of mixed breeds (black predominating). |
| White and black | As in Dhanni or cattle of mixed breeds (white predominating). |
| Nuqra | Dhanni. Spots under skin. |
| Any combination of
above colours | (In animals of mixed origin). The colour predominating
should be mentioned first, e.g., 'Red and white' (red
predominating). |

5. Horns

The following distinct types to be recognised :—

Hornless.
 Dajal or Haryana type.
 Hissar type.
 Mysore type.
 Gir type.

NOTE.—(i) In certain cases, where the horns do not conform to any of the types mentioned above, it would be necessary to indicate the direction of the horns as 'upwards' 'downwards', 'backwards' or 'forwards'.

(ii) For the recognition of the standard type of horns indicated above, it would be necessary to issue a sketch of each type for general information of those interested in this Scheme.

6. *Sheath*

The following three distinct varieties should be recognised :—

- (1) Loose, triangular and hanging sheath as seen in the Montgomery cattle.
- (2) Very small, indistinct, tucked up sheath as seen in Hariana or Dhanni cattle.
- (3) A small but distinct sheath, mid-way between the above two as seen in animals of mixed breeds.

7. *Tail*

The following three varieties should be recognised :—

- (1) 'Short' tail . . . One which does not go beyond the hock.
- (2) 'Medium' tail . . . Reaches between the hock and fetlock.
- (3) 'Long' tail . . . Extends below fetlock.

8. *Forehead*

- (1) Bulging or convex.
- (2) Flat.

9. *Colour of Testes and testicles*

- (1) Black (as in some Dhanni cattle).
- (2) Pink.
- (3) A combination of the above two.

10. *Skin*

- (1) Thin and fine, as in all well-bred animals of Dhanni and Hariana breeds
- (2) Coarse, as in the cattle of mixed breeds.

APPENDIX XV(a).

NOTE ON SUBJECT No. 17, BY MR. P. R. KRISHNA IYER, G.M.V.C., ASSISTANT VETERINARY RESEARCH OFFICER, IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.

One of the most spectacular advances in modern physiological knowledge during the last decade has been that dealing with sex hormones and sex physiology. Various biological and chemical tests have been devised for the diagnosis of pregnancy in human beings and the domestic animals. To-day the endocrinologists have arrived at a stage when the entire sex functioning apparatus can be stimulated, restarted or perverted by hypofunction or dysfunction, not by methods of organotherapy but by hormone therapy and various preparations are now available in the market. So far as work on domestic animals is concerned, there is a very extensive field awaiting exploration.

Gonad stimulating hormone. (Pregnant mare serum, human pregnant urine, Prolan A and B, Antuitrin—S, and Follutein)

Many workers have pointed out that the mare at about the 75th day of pregnancy, when the concentration of gonado-tropic hormones, is exceptionally high, can be used to provide an active supply of gonado-tropic hormones which may be used clinically to stimulate the production of ovulation in certain cases of mares which for pathological or other reasons have become sterile. The anterior pituitary-like hormone of human pregnancy urine has now been extensively employed therapeutically in the treatment of sexual under-development. Human infantilism which is otherwise known as hypopituitarism, in cases of hypertrophic metritis associated with excessive bleeding, in aspermia in the males and in the production of testicular descent in cases of undescended testicles and particularly in the cryptorchid horse so to avoid the risks attending the removal of an intra-abdominal testis by operative means, Hart and Cole (1936) claim excellent results with the use of pregnant mare serum. In ewes pregnant mare serum induces gonad stimulation with follicle maturation and ovulation. Pregnancy following breeding occurs in these cases and this procedure is of considerable value in this species when early lambing is desired by sheep owners. In impotent rams, pregnant mare serum produces sexual libido and normal breeding. It stimulates the germinal cells in the semeniferous tubules, but it has no effect in males lacking in normal sperm. Pregnant mare serum has been used in sexually inactive bulls, stallions and boars and the normal restoration of sexual libido resulted. Wild animal in captivity can now be made to breed at any time one desires. In a fox farm where the unresponsive males failed to serve rutting females, a single injection made them promptly serve their mates as early as 24 hours after injection. In cows and mares which fail to come in heat, about 750 Rat Units produces the desired physiological reaction.

Overdosing in the female produces excessive ovarian activity with the result that luteinisation occurs with a production of corpus luteum hormone which inhibits the action of the gonad stimulating hormone. Experiments have shown that male animals which fail to serve females after being kept on deficient diet, readily do so under the stimulation exercised by gonado-tropic hormones. Thus it is evident that this hormone is indicated in cases of impotency in males of all species of mammalia, as well as in females that fail to come in heat.

At this Institute testicular descent in immature male rabbits has been produced in less than 36 hours after injection with human pregnant urine. These animals exhibited considerable sexual excitement at the mere sight of female rabbits.

Human pregnant urine in bulls, which have become slow, and Prolan A in buffalo cows failing to show oestrus have also given good results.

Oestrogenic hormone. (Ovarian hormone, Theelin, Theelol, Amniotin, Emmenin, Folliculin)

This brings about hyperplasia of the vaginal epithelium with cornification and hyperplasia of uterine endometrium, increased uterine muscular contractions, and produces the onset of mating reactions and induces growth and branching of the mammary glandular system. It is indicated in cases of chronic metritis and vaginitis by virtue of its effects on the epithelial cell activity. As it stimulates the uterine musculature to marked rhythmic contractions, it may be employed in causing the evacuation of uterine contents in cases of pyometra and in cases of dystokia caused by uterine inertia. Experimentally, abortion can be produced by the injection of oestrin in animals during the later stages of pregnancy.

Corpus luteum hormone. (Progestin, Corporin, Progesterone)

This induces growth of uterine glandular elements and inhibits the motility of the uterus and is absolutely essential for the implantation of the ovum in the endometrium and for the continuation of pregnancy. It is indicated in cases of sterility and of habitual abortion for which no organic cause can be found and which are specifically due to abnormal uterine irritability during the early stages of pregnancy before the foetus is securely anchored by a fully developed placenta. Such cases are caused by deficiency of this hormone, the replacement of which will overcome this trouble. There are now several reports of cases of threatened abortion treated with favourable results in the human female. It quietens unfavourable contractions of the uterine muscle and corrects any unfavourable histological state of the endometrium. It relieves uterine pain due to relaxation of the uterine muscle and thus cases of dysmenorrhoea can be benefitted by small doses of this hormone. This hormone either alone or in association with vitamin E given in the form of wheat germ oil will prevent abortion in pregnant farm stock.

Prolactin stimulates actual milk secretion in a fully prepared mammary tissue. It can be used where lactation fails to develop adequately after parturition, with good results. It has, however, no action in increasing the normal milk yield of a lactating cow. It induces maternal behaviour in all mammals and is concerned in the induction of broody behaviour or the incubation instinct in the fowl. Non-broody races of fowls start clucking and nesting after its use.

Hetzel (1936) indicates the therapeutic benefit that may be derived from the use of Prolan A followed by Oestrin in cases of uterine and ovarian hypoplasia which are frequent in heifers and foals and characterised by want of development of the said organs and absence of heat. The same treatment is applied in cases of ovarian and uterine atrophy due to inanition or presenility. Prolan B is said to have some beneficial effect in cases of cystic ovaries. Extensive stabulation and intensive alimentation often bring about a condition of "Anaphrodisia" in cows and mares where Oestrin is indicated. Cows which fail to conceive after having come in heat due to defective appropriation of the uterine mucosa can be given Oestrin before fecundation. In cases of uterine cystic glandular hyperplasia, which is common in old carnivorous females, Prolan B is said to be efficacious. Administration of Prolan A is also said to increase egg production in hens.

In concluding, it may be observed that careful attention must be given to the proper diagnosis of the condition and careful selection of the product. When these are properly considered, interesting and valuable results can be expected from the use of these products as therapeutic agents.

APPENDIX XV(b).

NOTE ON SUBJECT No. 17, by MR. P. T. KERR, I.V.S.

The condition of slow breeding as we regard it from a domestic point of view is not really an abnormality. It is normal that the female should concentrate on rearing the young one produced until it is self-supporting or nearly so, at any rate until the need for full milk production is greatly reduced when the animal instinctively prepares to breed again. This process is also governed to some extent by seasonal and climatic conditions. The stimulus usually being the plentiful supply of fresh food.

Under domestic conditions we want to speed up this process and for this proper management and more than normal food are required. In my experience most of the cases of slow breeding in both cows and bulls are due to the fact that the food and management are not such as are conducive to speeding up reproduction. In some cases the fault is too much food and too little exercise but more often it is the reverse. In many parts of India the soil is deficient in essentials such as lime, salts and iodine, and sometimes there is vitamin deficiency. There are also some breeds which are proverbially slow (Sahiwal) and seem particularly resistant to the speeding up of domestication.

In Bengal we have found that an animal can be stimulated to breed in spite of the above faults in feeding and management. Cows can be induced to breed, and bulls to serve again, but in neither case will the improvement be lasting if the errors in management and feeding are not corrected. In a great many cases the improvement can be effected by proper care alone, but the administration of hormone makes the response quicker.

In this way hormone treatment can be of very definite use. A lay owner who sees a prompt response to the hormone treatment is more willing to carry out the instructions for better care and management.

Bulls.—To deal with case of bulls first.

The common causes of slow breeding are :—

Running with a large herd and getting too much service and too little feed to keep him up to the mark. He gets plenty of exercise. The remedy is obvious, but if really well fed he may become troublesome.

Keeping the bull tied up, feeding him well but giving little or no exercise. The tendency to cut exercise in this case is enhanced as the bull very soon becomes troublesome, but he also gets fat and lary from a service point of view, and prefers self abuse to attempting to serve elusive cows, which are frequently brought when not properly on heat and not ready to stand.

Constitutional lethargy in breeding.—This is probably due to deficiency in diet from birth and improper care.

In all the above cases hormone injection does produce early results, as a rule, but this improvement will not be maintained unless the other factors are eliminated.

I have advocated for many years that a Stud Bull should do a full day's draft work every day, be fed to keep him in good working condition and he will still be able to serve 80 to 100 cows a year, the feeding being gauged by his condition. A number of bulls have been restored to service through work and feeding alone.

Cows.—Among cows this method of stimulating reproduction is only applicable in carefully controlled breeding herds and commercial dairy herds. In the latter it should be of very great use. Normally a dairy cow should be in calf by the end of the third month after calving. Should she have shown no signs of oestrus by the end of the second month it would be sound practice to give hormone treatment. It is true that in many cases the lactation period is shortened or the total yield reduced by early service, but if the loss entailed by a long dry period is considered the balance will all be in favour of this practice.

Hormone treatment.—As stated in my note on this subject published in the Journal of Veterinary Science (Volume 1, Part III, 1932) the treatment is based on

the Zondec-Aschheim reaction, in which the response to the injection of the urine of a pregnant female is used as a diagnosis for pregnancy. In this treatment the response is used as a means of inducing pregnancy.

The technique set forth in the note above referred to is that recommended by the Institute of Animal Genetics, Edinburgh, but we have found it practicable and safe to simplify this method for general use provided the pregnant urine for injection can be obtained fresh and used at once; the practice is to collect it in a sterile mug, discarding the first few ounces voided. It is then filtered through ordinary filter paper and injected subcutaneously in doses of 10 c. c. per 100 lbs. body weight, with ordinary aseptic precautions. One dose is given daily on four consecutive days. This treatment is already in use in a commercial dairy and has proved valuable. It has also been used by my staff in the treatment of bulls kept by public bodies, and jail cows, and in the majority of cases it has proved satisfactory.

In this connection it is interesting to note that such injection has not produced in England the results which we have obtained and the officer consulted at the Genetic Institute was surprised at our getting them. It is true that slow breeding is not a common condition in English cattle, and when a cow fails to come in season or to hold to the bull there is usually a definite cause for the sterility whether it is temporary or permanent. This injection is in no way a cure for sterility resulting from uterine disease, or vaginal acidity or specific disease. The injection of an excess of the hormones contained in pregnant urine appears to stimulate the internal secretion glands of the animal to fuller function and restore the desire to breed. Why these results we obtain in India do not conform to those at home I am unable to explain. It may be a peculiarity of Indian cattle.

Without being able to explain the reason I can certify to the usefulness of the treatment.

Attached is an extract from my previous note as an appendix in which the technique for preparation of the urine advocated by the Genetic Institute, Edinburgh, is given in detail.

I trust that the discussion of this note will result in the method being given a wider trial than has been possible in my department, in which cases requiring treatment are relatively few.

APPENDIX.

Technique.

The urine is collected from a known pregnant cow. The later in pregnancy the better. It may be collected in a clean mug as it is passed, or drawn off by catheter. This is not essential and most cows object to catheterisation.

About 400 c.c. are required for each case. The dose being 10 c.c. per 100 lbs. body weight, injected on four consecutive days.

The urine is placed in a flask and to each 100 c.c. is added 5 c.c. of a 20 per cent. solution of sulpho-salicylic acid and well shaken for ten minutes to precipitate proteins. It is allowed to stand and settle or may be passed through a coarse filter paper. The clear liquid is then acid and must be neutralised by the addition of bicarbonate of soda. We continue adding bicarbonate and stirring until it is faintly alkaline to litmus. It should then be poured into sterile bottles, capped and sealed with paraffin wax. One dose in each bottle.

If it is to be kept for some time it would be better to pass it through a Chamberland filter L 3, and to run a thin layer of toluol over the surface to prevent oxidation. If it is then kept in cold storage it is believed it will remain potent for several months.

Hormone, which is probably a mixture with a predominance of the secretion of the anterior pituitary gland, is not specific and may be used for other animals. It is also active in bulls. We have not tried it in other males.

APPENDIX XVI.

NOTE ON SUBJECT No. 18, BY CAPT. S. C. A. DATTA, B.Sc., M.R.C.V.S., IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.

Uses and advantages.—The introduction of the seminal fluid into female genital passages with the help of instruments was first carried out by Spallanzani in about 1780 A. D. on dogs. The method was later employed in a few cases of sterile marriages in man, and also in domestic animals where normal matings had failed to be productive due to faulty conformation of the genitalia, or due to certain other causes, notably abnormal vaginal secretions. Regarding the clinical use of artificial insemination the experience of a recent breeder shows that 60 per cent. of his previously sterile cows conceived successfully when subjected to it. The most remarkable application of the method, however, was, conceived by Ivanov in 1898 for purposes of large scale animal improvement, and the extensive practical work carried out since at the Institute of Artificial Insemination, Moscow, and under the Sheep Trust in U. S. S. R., has amply demonstrated the very great economic value of the method. Technical obstacles of different kinds were no doubt encountered but it is gratifying to be able to state that the method has definitely passed the experimental stage, and has already been adopted in a few other countries. In regard to the extent to which the method is applied in Russia it may be stated that 2,00,000 cows and a large number of sheep were inseminated in 1932.

Experience collected to date has shown the following advantages to accrue from the adoption of artificial insemination :—

- (1) The rate of progress in livestock improvement is enormously increased, and the time required for grading up is proportionately reduced, while the productivity of selected sires is greatly increased. The best results so far recorded appear to be in sheep. On a farm, one ram is known to have sired in one season a crop of 2,580 lambs, and the best Karakul ram there sired 700 lambs for export. The percentage of conception was shown to be equal to or above that for natural insemination. Experiments among bovines have shown that from 1,200 to 1,500 calves can be sired by a single bull during a 60 days' breeding season, and that a single ejaculate from a bull can inseminate as many as 400 cows.
- (2) Improvement schemes become more practicable, and the existing obstacles and limitations of a country in regard to its resources, whether money or fewness of the required type of sires, can be largely surmounted.
- (3) Sires of high milk yielding daughters can be widely used, without running the risks and expenses of transporting animals to distances.
- (4) Expenses for the purchase and upkeep of pedigree sires are minimised (due to a lesser number of these being required), and the necessity of breeding from nondescript or second grade males is obviated.
- (5) Risks of genital infection, and injuries to sires and dams are eliminated. Breeding programme need not be interfered with when epizootics are raging. Artificial insemination for combating infections has become popular in Germany (Feiling & Fuch).
- (6) More extensive benefit can be derived from the existing personnel employed in livestock work.
- (7) Animal Husbandry becomes more profitable with greater returns in the shape of food and cash.
- (8) Scope of breeding schemes is extended to include species-hybridisation for the purpose of creating new and economically more productive types, for instance, the crossing of the buffalo and the ox species is now being attempted. In Kirghizstan, species crosses with mountain sheep are progressing favourably, while the artificial insemination of the Red German cows with Zebu sperm, carried out for establishing a strain with high butter fat content, is reported to have been singularly successful.

Present position.—Passing on to the actual working details of artificial impregnation, it will suffice our purpose here to restrict our remarks to comparatively recent advances made. To commence with methods of collection of the seminal fluid, the old sponge method has now been superseded in Russia by the Rubber Sperm Collector, while people elsewhere are in favour of the Artificial Vagina or the Dummy

method. The other advance recorded concerns the working out of optimum dilutions and dosage of semen, required for impregnating members of the different species of domestic animals, and the elaboration of the most suitable diluent mixture to suit each case. Further the Russian Institute has put on the market an improved glucose-phosphate dilutor containing lipoids and peptones as the most favourable medium for spermatozoa, while a simpler sulphate dilutor and others are also obtainable in ampoules. In the Cambridge storage method, sperms are kept under a layer of liquid paraffin to ensure potency. In the case of stallions, the dilution 1:1 has produced the highest percentage of inseminations, while a higher dilution of 1:32 or more can be used in cattle. In order to appreciate roughly the significance of seminal dilutions in Animal Husbandry, one can do no better than quote from an authority who remarks: "It is calculated that one ram during a 16 days' breeding season can yield 32 c.c. of sperm. Undiluted this will inseminate 150 ewes and fertilise 130 (86 per cent.). Even if the minimal dose advocated by Kuznecov is used i.e., 0.04—0.08 c.c., then the number will rise only to 526. On the other hand with a dilution of X8-16, it will be possible to inseminate 1,200—2,400 ewes, of which, say 1,300 will be fertilised". Besides the above-mentioned advances, an achievement of far greater consequences is the success now recorded in keeping sperms alive for 20 days in a gluco-phosphate dilution fluid, maintained at a temperature of 15 to 25° C., and in transporting semen, without undermining its efficiency, over long distances in specially constructed receptacles. Ordinarily the usefulness of insemination is limited to the number of females that may be in heat, and since the majority of cultivators possess only a limited number of females, it is not possible to exploit the method to its fullest advantage at present, and methods of improved organisation for wider application, and of artificially inducing heat and ovulation in animals are now being experimented upon. Data are now available regarding the average duration of oestrus and the time of ovulation, and the optimum time for fertilisation in the oestral period of each species of animal has been ascertained. Since some animals in heat may not show much obvious changes to the eye, the use of a teaser animal, and microscopic examination of vaginal smears have been advocated.

Practicability in India.—In the past 30 years and more, attempts have been made on a comparatively small scale to improve the livestock of India by improvement of indigenous breeds by selection, and by the importation of bulls of high yielding dairy strains, particularly in Government farms. The attempts have so far not produced outstanding results, due to a variety of causes, but largely because of the lack of continuity of policy, and because an insignificant fraction only of the breeding females among the teeming millions of cattle, buffaloes, sheep and goats have had access to first class sires. Referring to the major portion of India, Col. Oliver recently pointed out that the available improved bulls do not amount to more than approximately 1 to 1,000 of the number needed, and that it is clear that such small numbers can produce little general grading up; even where they are restricted to strictly limited areas and the supply maintained long enough to eliminate the old stock and establish the new. It has been rightly pointed out that no Government can go on indefinitely breeding, purchasing or subsidising pedigree sires. The betterment of animals is receiving considerable stimulus all over the country, and the need of a unified breeding policy to be pursued through generations has been stressed.

It is considered opportune now, therefore, to review the facts in favour of Artificial Insemination in relation to the special requirements of the Indian situation. The method having produced 400 times more offspring than possible from natural service, it is obvious that the goal of general grading up of Indian livestock can be achieved more readily in a shorter period, diminishing wastage and utilising the present resources to the maximum amount available. As in Russia, an Animal Genetics Institute will be required to carry out systematic experimentation regarding the modifications in the technique that Indian conditions may require, and for field trials the existing Government and other model farms should be useful. The production of good sires in sufficient number to establish appreciable permanent effects on the bulk of Indian stock is not possible within a measurable distance of time under present conditions, but with the bringing of fertilisable females within the reach of artificial inseminating material of the highest order from a central station or provincial stations, scientific breeding control (with the elimination of scrub males) in distant villages would be practicable. For a vast continent like India, having agricultural and geographical features in common with U. S. S. R., the tremendous possibilities already demonstrated, cannot but make a very great appeal when animal improvement measures on a broader and more substantial basis are being considered, particularly as the financial resources of the country are very limited.

APPENDIX XVII.

NOTE ON SUBJECT No. 19, BY MR. A. M. LIVINGSTONE, THE AGRICULTURAL MARKETING ADVISER TO THE GOVERNMENT OF INDIA.

The report is not as yet available for circulation. The Marketing Officers concerned have been kept busy during the last month or two with the opening of the hide grading stations at Agra and Delhi and the egg grading station at Taruabba in the N.-W. F. Province. A good deal of time has also been spent in making supplementary enquiries and in checking figures but the compilation of the material provided by the Provincial and State marketing staffs is now nearing completion. The following notes indicate the main lines of the report.

Supply.—The cattle census merely indicates the general distribution of the various types of livestock throughout India and is no indication of the total available market supply of cattle. Figures so far collected show that between two and three million cattle are annually sold in the larger fairs, i.e., those where more than 5,000 cattle are to be found. When the numbers sold in the innumerable smaller markets are taken into account it is apparent that the total marketed every year reaches a very large figure and that the value of the trade runs into crores of rupees.

It has not been very easy to arrive at the localisation of producing areas. It is apparent, however, that as the total cattle population is practically stationary the number of rising young stock are at least sufficient to maintain the present adult population. It seems equally safe to assume that in those areas where young stock in relation to adults are present in a higher proportion than the average—and particularly where the proportion is very much in excess—there is a surplus of young stock over and above what is required for maintaining the local cattle population and that such areas may be therefore regarded as the main centres of supply. Conversely in any area where the proportion of young stock is low the deficiency must be made up by drawing on the surplus producing centres. Maps have been prepared on this basis in respect of oxen, cows and she-buffaloes and the areas indicated by the map correspond very closely with actual facts as ascertained in the course of the survey.

Transport and Movement.—Complete information on this point is difficult to obtain since large numbers of cattle move by road in preference to rail. The total number of animals put on rail throughout the whole of India in the course of a year does not exceed 2½ lakhs. The figures of road traffic are very much in excess of this. For example one small family of dealers alone transport between 30,000 and 50,000 cattle a year by road between Central India and south-eastern Central Provinces. In general it appears that bullocks and bull calves are normally moved for distances up to 300 miles. Milk animals which are mainly intended for urban use have to be taken to areas which are usually 500 to 800 miles from the place of production. A map has been prepared showing the routes used in the transport of cattle from which it is clear that the general movement is from north to south and west to east.

Prices.—The problem of prices may be appreciated from the fact that bullocks may sell from Rs. 5 to Rs. 2,000 per pair and a cow from 8 annas to Rs. 300 or Rs. 400. A system of classification will have to be worked out so that prices in different markets may be made intelligible to all concerned. It would appear that milk stock should for the purpose of quotation be arranged in two or three main groups on the basis of breed-tract type, lactation and yield and the prices should be quoted as so many rupees per seer. Bullocks also should be classified according to breed-tract and grouped as "heavy" or "light" and each of these sub-divided as "large" or "small", i.e., those above and those below a certain height. All markets should be quoted on the same basis.

Marketing Methods.—Apart from local purchases and sales the trade in livestock is very largely in the hands of three or four main groups of nomadic or quasi-nomadic castes or tribes, e.g., the Banjaras, Reddis and Chettis whose business extends, over very wide areas. In the main it appears that they arrange for the sale of cattle to villagers on the basis of instalments which they collect periodically as they pass backwards and forwards.

Market Charges.—The fees levied in markets and fairs vary enormously from one place to another. Octroi duties and terminal taxes are also great sources of expense in the transit and sale of cattle. The charge made by brokers in the markets apparently vary from about 0.40 to Rs. 3 or even higher. For every sale in some fairs a charge of 0.40 per head or it may be 0.03 to 0.06 per rupee is made. In slaughter houses where methods leave much to be desired the charges are also very variable and range from one anna to rupees fifteen per head.

Summary.

It seems evident at this stage that the recommendations of the report must be directed towards the following main points.

Road transport for example is a lengthy process and apart from the depreciation of the cattle through ageing there is a constant loss *en route* owing to disease, and the danger of spreading disease from village to village throughout the country is fully realised by the dealers themselves. There seems therefore a great need for further developing railway traffic in livestock. This would probably involve some readjustments in the numbers, places and times of holding regular markets.

The layout of markets and fairs generally is capable of much improvement and also their supervision. This is particularly so in the case of slaughter-houses. The charges including brokerage levied in markets and fairs are capable of reduction. Although it might be impossible to make them uniform in every case, the amount of recognised charges in each market or fair should be fixed and known to everyone concerned particularly the distant senders. At the moment it is an open question whether there is any great need to apply the provisions of any of the provincial regulated markets Acts to cattle markets and fairs but it does seem that something might be done in the way of stabilising these charges by the licencing of brokers operating in these markets. Co-operative societies of producers in India play a negligible part in the sale of livestock and in regard to the wider question of organising the trade generally it would seem that this might best be done through the cattle dealing castes and tribes already referred to.

APPENDIX XVIII.

NOTE ON SUBJECT NO. 20, BY MR. NURUL ISLAM, ASSISTANT MARKETING OFFICER,
GOVERNMENT OF INDIA.

Brief History of the Poultry Industry in India.—Before entering upon the subject to be dealt with a brief review of the Poultry Industry in India seems necessary. Egg production has been carried on in India from time immemorial but in a very unsystematic manner. The following picture, given by Mrs. A. K. Fawkes, late Poultry Expert to the United Provinces Government in her evidence before the Royal Commission on Agriculture in India is of interest :—“The poultry keepers of India are poor and ignorant men and they make no attempt to select or breed their poultry on any system. The birds interbreed as they please, and roam the villages scavenging in the drains and rubbish heaps of the vicinity for their food. An occasional handful of grain is all they can hope for, and they depend, like the fowls of the air, on what they can find for themselves.”*

There are very few pure-bred indigenous breeds in India. The Asil (fighting game fowls of India, noted for their 3-day fights) and Chittagong are the only two which can be called pure, and considerable mongrolisation has taken place, of late, in these two breeds as well. Mrs. Fawkes says, “At the present day there are four divisions of fowls prevalent in India; they are as follows :—(1) The division whose type mostly resembles the jungle fowl, these birds carry the jungle fowl colouring and shape, are quick maturing, high flying, rarely exceeding 3 to 3 1/2 lbs. in weight, and are poor producers. This resemblance is noticed to be stronger in the villages close to the habitations of the jungle fowl. (2) The type most closely resembling the Indian Game, being heavier in weight, slow maturing, tight feathered useful as table birds but poor layers. The pure-bred game is rare and only found in certain breeders' hands. Indian Princes and others keep them mostly for cock-fighting purposes. They are not obtainable outside these circles. The Chittagong fowl, a native of that district, is a valuable pure breed of India well worth attention. (3) The third type of fowl shows a strong admixture of foreign blood. Sometime the influence is from further East, the Chinese type predominating, but more often Western breeds of fowls show their characteristics. These types of fowl are more of a commercial asset to the country, as although very mongrel they are of better size and are better producers than either of the types previously mentioned. (4) Various types not included in the above classification may be said to form the fourth division of fowls, one variety of which is perhaps worth mentioning in that it has the peculiar characteristic of being black skinned and black in flesh, but it is of little commercial value.”

It appears that the number of fowls belonging to the third division has considerably increased since the publication of the above report. What is generally called the indigenous or Desi fowl is a non-descript bird, being the result of promiscuous breeding. From the reports on the Marketing of Eggs, hitherto received from the provinces, it appears that about 95 per cent. of the total fowls in India belong to the indigenous or Desi type. The indigenous hen lays, on an average, a 1 1/4 oz. egg.

Improvement of the Industry.—Attempts at improving the Poultry Industry in India are of fairly recent origin. The Indian Poultry Club, the Mission Poultry Farm, Etah (United Provinces) and the U. P. Poultry Association were the first to start, commencing their activities in 1910, 1912 and 1919 respectively. The proposed establishment of a Central Poultry Research Institute at Izatnagar, U. P., and Grading and Packing stations for eggs, under the Government of India, are some of the latest developments.

Comparative Production of eggs of the two types of birds (Indigenous and Crossbreeds) from the points of view of quantity and quality.—Experiments on both crossbreeding or grading and selective indigenous breeding are in progress in many of the provinces in India but the experiments on either systems of breeding are not complete enough to draw very definite conclusions. The former method is receiving particular attention in the United Provinces, the Punjab and Bengal whereas the latter is being tried in the Punjab and Madras. India's essential requirement appears to be a race of fowls which combines productivity and hardness. It is therefore interesting to see how the two types behave in egg production. An indigenous hen, as has already been pointed out, is a poor producer but, when crossed with imported males of highly fecund strains of fowls or their sons, producers progeny-laying a larger number of, and bigger, eggs. Appendix A will explain this.

*Royal Commission on Agriculture in India, Volume VII.

It is clear from the appendix that the increase in the performance of a hen resulting from selective indigenous breeding, over her unselected indigenous mother is 21·7 per cent. giving a return to the egg producer of 0·5·6 per bird per annum whereas in the crossbred daughter it is 43·5 per cent. giving a return of 0·11·0 per bird per annum.*

The records of other provinces unfortunately cannot be used for the purpose of comparison very accurately as except at Gurdaspur Farm, Punjab, there is no place where both the methods are being simultaneously worked. Where one system is being practised the other apparently does not find favour. It may be pointed out that, out of the 4 Provinces from which relevant data is available, 2 are crossbreeding, 1 is both crossbreeding and breeding selectively, and only 1 is carrying on selective indigenous breeding exclusively. This, it appears, is due to the fact that much quicker results are obtained by crossbreeding than by selective breeding with indigenous birds. And the egg producer in India wants quick results without which it is difficult to induce him to take up any method. If the averages of the totals are taken into consideration the increase in egg yield works out to 23·2 per cent. in the case of selected indigenous bird and 62·2 per cent. in the crossbred, and the increase in return 0·5·9 per bird per annum in the case of the former and 0·15·6 in the case of the latter. There appears a definite increase in the size and weight of the crossbred egg, of the F1 generation pullets. "Purebred male birds, bred for egg production, have been crossed with village hens. The progeny resulting from these matings have produced double the amount of eggs of the original mothers, and the size of eggs has increased from 1 1/4 oz. to 1 1/2 and 1 3/4 oz. each egg."†

Keeping quality of the two types of eggs.—It appears that the keeping quality also improves in the case of a crossbred egg. Recent research carried out in this connection has shown that evaporation is more rapid in eggs with brown shells than in white shell eggs. The results of investigation carried out by Ulrich and Davidson are as follows:—"The experiments dealt with brown *versus* white eggs, and it was found, contrary to general belief, that the shrinkage in the brown eggs was greater than in the white. It appears that in brown eggs the pores are larger and thus facilitate evaporation. In spite of the heavier shell of the brown eggs after a period of 30 days they showed a shrinkage of approximately 6 per cent. against 5 per cent. in the case of white shells." (London Egg Exchange Review). An analysis, recently made of the market eggs in Delhi, revealed that 65 per cent. of the market eggs had brown or brownish shells.

TABLE 1.—Brown versus white eggs.

Brown.				White.			
Per cent. in Delhi market.	Average shell per cent.	Per cent. shrinkage.	Evaporation.	Per cent. in Delhi market.	Average shell per cent.	Per cent. shrinkage.	Evaporation.
65	0·51	Approximately 6 after 30 days.	More rapid than white.	35	0·46	Approximately 5 after 30 days.	Less rapid than brown.

Seasonal Production of the two types of birds from the point of view of meeting the market demand.—As both production and market demand for eggs of the two types are subject to seasonal variations and as the former has to be adjusted to meet the latter it seems necessary that brief description of these two factors should precede any discussion about a breeding programme for commercial egg production.

It is observed from Appendix B that most of the eggs are produced in most parts of the country from February to May in the plains when the demand is just decreasing due to summer conditions. The demand is observed to be highest usually in the cold weather, particularly during the X'mas week when production is generally

*These figures relate to the data made available by the Poultry Expert to the Punjab Government.

†The results of work carried out by Mrs Fowler in this connection were described before the Royal Commission on Agriculture in the above words.

low. Although these factors are common to both the indigenous and crossbred types, the broody period of the two—viz., 15 days to 60 days and a week to 20 days respectively—makes a great difference. It follows, therefore, that the production of eggs in the case of the crossbred is more evenly distributed than in the indigenous. This, in turn, makes more crossbred eggs available for market during winter when the demand is at its peak, than the indigenous eggs.

Comparative market demand for eggs of both types.—It appears from the provincial reports that the demand for the improved or crossbred eggs is increasing due to the recognition of the better food value and the size of eggs. The trend of the number of the table eggs handled by the Etah Egg Sale Union Ltd., is as follows :—

TABLE 2.—*Trend of demand of crossbred or improved eggs.*

Year.	No. handled.
1931-32	1,081
1932-33	1,433
1933-34	3,972
1934-35	4,172

Although a greater portion of the above eggs was from purebreds (White leghorn, Black Minarcas and R. I. Reds) the figures include crossbred eggs as well. The Mission Farm, Katpadi, Madras Presidency sold 48,560 improved eggs in 1934-35, almost all of which were crossbred eggs. The Hotel Managers are also of the view that the market demand for better eggs is on the increase. The development of systematic egg grading is almost sure to stimulate the demand for bigger eggs.

Comparative costs of production and maintenance of the two types of birds and the losses in the marketing of their eggs.—An important point in commercial egg production is the cost of production. Although the crossbred bird lays a larger number of eggs which are bigger and of a better keeping quality, it appears that there is practically no difference in the cost of maintaining the two types and the cost of production. The production methods of the owners of crossbred birds are better, and generally their eggs pass through fewer handling channels. The keeping quality of the crossbred egg is better than that of the indigenous, losses in marketing are practically nil in the case of crossbred eggs and are as high as 45 per cent. in the case of ordinary indigenous eggs.

Prices received for the two types of eggs.—In the matter of price, which is one of the most important points in commercial egg production, it appears from Appendix C that the returns received by producers of crossbred eggs are over 100 per cent. higher than that obtained by producers of indigenous eggs. This is, however partly due to differences in quality and partly to the difference in the methods of marketing and the figures are on that account perhaps not strictly comparable.

Comparative hatchability, rearability and hardiness etc., of the two types.—It appears from the following view expressed by Mrs. Fawkes in her book 'Poultry farming in the East', that crossbreeding improves hatchability as well. "The advantages of crossbreeding are improved hatchability, rearability, hardier and larger birds, less liable to disease, quicker growing and better layers."

Difficulties of crossbreeding, as compared to selective indigenous breeding and their possible solution.—There are, however, two arguments which are often advanced against crossbreeding (1) that it is difficult to distinguish between the male progeny of the F1 generation and the purebred White Leghorn male and (2) to keep the crossbred cocks away. A solution of these difficulties may be found in the following :—A few L2 White Leghorn cocks should be distributed in a village and given to responsible persons. Every such cock should wear a coloured leg band or any distinguishing ring to facilitate identification. No other males should be so ringed. The hens intended for mating, should be brought in the morning to the cocks' pen, once in 8 to 10 days, and handmated. This method is quite common amongst the Asil breeders in India and is also advocated and practised by a well-known Dutch Poultry Geneticist of Holland, Dr. A. L. Hagedoorn (Feathered World, Dec. 14, 1934). Handmating has two distinct advantages viz., (i) it obviates the necessity for lot of labour in looking after and segregating lot of birds and (ii) the male bird actually trends all the hens in rotation and not one hen many times a day and a second hen not at all. All the crossbred males should be sold for the table when 3 months old. An easier method is to six day old chicks and sell off the males as early as possible. It is hardly necessary to point out, in this connection, that it is

impossible to carry out, amongst the poultry keepers in India, any **SYSTEMATIC** breeding programme—be it selective indigenous breeding or crossbreeding with imported poultry—unless there is an expert and adequate advisory staff to see that the breeding operations are proceeding in accordance with the lines laid down and, to ensure this, the institution of a proper course of instruction in Poultry Husbandry, at the Central Poultry Research Institute, seems indispensable.

A great difficulty, experienced in breeding with indigenous males is to find the right type of male as it is the male that transmits the high egg production factor to the daughters. Unless a male is selected by means of progeny testing, which is an expert's job and beyond the scope of the egg producer, it is difficult to find an indigenous male of a known good pedigree.

Summary.

It therefore appears that selective breeding is a longer and more hazardous process than crossbreeding. It seems, however, that more attention has been devoted hitherto to crossbreeding than selective indigenous breeding. As matters stand it is observed that the advantages to be gained by crossbreeding are as follows:—

1. Quick results.
2. Greater number of eggs per bird.
3. Increased size of eggs.
4. Increased hatchability, rearability, body size, growing power, ability to resist disease and stand adverse climatic conditions.
5. Better keeping quality of the eggs.
6. Greater uniformity in the production during the different seasons.
7. Better prices.
8. Lesser losses in marketing.

A summary, based on the work hitherto done, of the disadvantages of crossbreeding and advantages and disadvantages of selective indigenous breeding is also given below.

Disadvantages of crossbreeding.

1. Difficulty in keeping the crossbred cocks away.
2. Difficulty in distinguishing the breeding male bird from the crossbred males.
3. Throw back.

Advantages of selective indigenous breeding.

1. Permanent improvement.
2. Hardiness of indigenous breeds.

Disadvantages of selective indigenous breeding.

1. Lengthy process.
2. Relatively poor production in regard to number.
3. Small size of eggs.
4. Long broody period.
5. Difficulty in getting pedigreed males for breeding.
6. Uncertainty of results.
7. Absence of fecund factor.

Annual Egg Production Figures of Unselected Indigenous, Selected Indigenous (Fi) and Crossbred (Fi) types.

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Province and Place (with source of information).	Unselected Indigenous.		Selected Indigenous.				Crossbred.				Remarks.		
	No. of eggs per bird.	Flock or Individual performance.	No. of eggs per bird.	Per cent. Increase over un- selected indigenous mother.	Increase of return in terms of money at 0-3-0 per dozen over the return from the unselected indigenous mother.	Flock or Indi- vidual per- formance.	Gene- ration.	No. of eggs per bird.	Per cent. Increase over un- selected indigenous mother.	Increase of return in terms of money at 3 annas per dozen over the return from the unselected indigenous mother.		Flock or Individual performance.	Gene- ration.
Punjab. (Gurdaspur, vide Mr. Harrop's note.)	*46	Average per- formance of an indi- vidual in a flock.	56	21.7	-5/6	Average per- formance of an individual in a flock.	F1.	66	13.5	-11/-	Average per- formance of an individual in a flock.	F1.	*Under scienti- fic manage- ment.
Madras. Hosur, as verbally reported by the Manager of Poul- try Farm.)	Not available.		†100	...	...	Average per- formance of an individual in a flock.	...	...	(Not practised.)	...	...	...	Kept on selen- tine lines. †Telchery or Kankuntti.
Bengal (Dacca, vide Ben- gal Egg Mar- keting Survey Report).	†104.5	Average per- formance of an indi- vidual in a flock.	(Not practised.)	...	...	...	...	123.0	31.1	-7/9	Average per- formance of an individual in a flock.	F1.	Kept on selen- tine lines. ‡Chittagong.
United Provinces. (Lucknow, vide re- view by Mrs. A. K. Fawkes of some breeding experiments car- ried out at the U. P. Poultry Association).	§49.0†	Average per- formance of an indi- vidual in a flock.	...	...	...	...	...	64.5†	30.0	-7/6	Average per- formance of an individual in a flock for 4 winter months Nov. to February.	F1.	Under ideal conditions of management. §Bursa Hens.

APPENDIX A—contd.

Annual Egg Production Figures of Unselected Indigenous, Selected Indigenous (F¹) and (F¹) types.

Provinces and Places (with source of information).	Unselected Indigenous.			Selected Indigenous.			Crossbred.				Remarks.
	No. of eggs per bird.	Flock or individual performance.	No. of eggs per bird.	Per cent. increase over un- selected Indigenous mother.	Increase of return in terms of money at 0-3-0 per dozen over the return from the unselected Indigenous mother.	Flock or indi- vidual per- formance.	No. of eggs per bird.	Per cent. increase over un- selected Indigenous mother.	Increase of return in terms of money at 3 annas per dozen over the return from the unselected Indigenous mother.	Flock or individual performance.	Gene- ration.
Lucknow.	...	...	...	...	...	...	156-5	...	...	Individual average from 7 hens.	F1.
Average of Total	63-3	...	78-0	23-2	~5/9	...	102-7	62-2	~15/6	...	...

Based on monthly averages for four years :—											
							1926-27	57-1			
							1927-28	55-3			
							1928-29	51-1			
							1929-30	52-2			

Based on monthly averages for three years :—											
							1927-28	75-4			
							1928-29	63-7			
							1929-30	51-4			

Periodicity of production of crossbred and indigenous types of hens.

Note.—The particulars have been taken from the Provincial Egg Marketing Survey Reports concerned.

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Periodicity of														Remarks.
Province or State.	Production of													
	Indigenous.						Cross Bred.							
	Maximum.	Minimum.	No. of eggs produced annually, during			Maximum.	Minimum.	No. of eggs produced annually, during						
	months.	months.	Feb. to May.	June to Jan.	Per-centage of total.	months.	March to April.	June, July, Sept., Oct.	50*	50	50	50	..	
Punjab . .	March to April.	June, July, Sept., Oct.	25	51.0	24	49.0	March to April.	June, July, Sept., Oct.	50*	50	50	50	..	
Bihar & Orissa	December to March.	May, June & Aug.	...	...	...	...	December to March.	May, June & Aug.	261† Ind.	52.5	236 Ind.	47.5‡ Ind.	15 days to 60 days.
Rurma . .	February to May.	July to September.	...	...	...	...	February to May.	July to September.	...	...	...	...	"
Delhi . .	April.	September, October.	...	...	...	...	...	...	...	...	...	...	"

Types are similar to those found in Delhi.
*This is based on percentages as monthly records of crossbreds are not available.
†This will not however, make any change.

Types are similar to those found in Delhi.
 *This is based on percentages as monthly records of crossbreds are not available.
 †This will not however, make any change.

APPENDIX C.

Comparative Prices received for two types of eggs—Indigenous and Cross-bred.

Note.—The particulars have been taken from Provincial Egg Marketing Survey Reports concerned.

Province and Place.	Price in annas per dozen paid to producers for			Remarks.
	Indigenous Eggs.	Crossbred Eggs.	Per cent. higher.	
Madras (Katpadi).	Rs. A. P. 0 3 0	Rs. A. P. *0 7 0 to 0 10 0	Over 100	*According to grades.
Bengal (Dacca)	0 1 6	0 6 0	"	
North-West Frontier Province (Peshawar)	0 2 3	0 4 6	100	
Punjab	0 3 6	1 2 0	Over 100	
United Provinces	0 3 0	0 9 0 to 0 10 0	"	

APPENDIX XIX(a).

NOTE ON SUBJECT No. 21. BY MR. W. S. READ, ASSISTANT SUPERINTENDENT (FOODER),
GOVERNMENT CATTLE FARM, HISSAR.

With regard to the improvement and development of the Hides and Skins Industry in India, the following points appear to be worthy of consideration :—

1. It is generally admitted that the producer does not get anything like a fair price for his hides and skins.

2. The big dealers and middle men are probably making far too much profit at the expense of the producer.

3. The above are probably the chief reasons for the decline in the export trade. If the dealer can make a substantial profit without having to concern himself much about quality, the standard of produce for export remains poor, and the foreign consumer commences to spend his money in a more reliable market. This is similar to the position in the wool trade, where the dirty condition of wool exported from India has been adversely criticised by the foreign consumer. Lack of interest in quality on the part of an exporting country is, in course of time, bound to lose that country its overseas markets.

4. I suggest that the bulk of any money allotted for the improvement of the Hides and Skins Industry, should be used at a point between the producer and the dealer. At present the producer brings in consignments of mixed skins of all sizes, qualities, varieties and conditions, and perforce has to accept the dealers' price, which is based mainly on the inferior skins in the consignment. The preliminary work, therefore, might well be concentrated on two things :—

(a) The establishment of Government commission shops between the producer and the dealer, which would grade each consignment in the presence of the producer, and pay him on the quality of each grading. This would teach the producer to grade his own bundles of hides, and as he would soon see that there was money in it, this would also make him keen on quality. The shop would re-sell the graded skins to the dealer.

(b) The establishment of bureaus for the rapid dissemination of the latest prices from the Hides and Skins markets, both to producers and to the Commission Shops. This is most essential, as at present the producer is selling in the dark, entirely at the mercy of the dealer. This work could no doubt be done through the Provincial Departments of Industries or Provincial Marketing Officers, and the local civil administrations. These prices should also be broadcast in Village Radio Programmes.

5. For the Commission Shops, in the Punjab at least, there is already an existing machinery at work, handling wheat, cotton, etc., it would only entail the addition of a branch to deal with Hides and Skins. Government finances these shops through the Co-operative Departments whose loans are repaid, I think, from the commission charged.

6. There can be little doubt that the main point of attack should be between the producer and the dealer. The producer would soon learn that attention to quality brings him better prices, and considerable control over the middle-man and dealer would be possible. The better quality of Hides and Skins would automatically improve foreign trade.

7. With regard to damage to hides by pests, the warble is undoubtedly the worst in the Hariana Tract and depreciates the value of the hides produced to a considerable extent. If the producer once realised that attention to quality paid him in the end, he would take more interest in warble-dressings.

Warble-fly campaigns would have immense value, and if it is proposed to spend money in this connection, preliminary operations should first be concentrated in the big cattle-breeding areas of the country.

APPENDIX XIX(b).

NOTE ON SUBJECT No. 21, BY RAI BAHADUR B. M. DAS, M.A., (CAL.), M.Sc. (LEEDS),
SUPERINTENDENT, BENGAL TANNING INSTITUTE.

SECTION A.

GRADING OF HIDES AND SKINS.

Necessity of grading.—Hides and skins are raw materials for the production of leather. The producible type and quality of leather largely depend upon the nature and basic characteristics of the raw hide and skin processed. The tanner is consequently greatly interested in knowing, as far as possible, at the time of purchasing hides and skins what result he may expect in his final product, and whether he will get the type and quality of leather which he wants to produce.

Hides and skins are now articles of international trade and they are often tanned in countries far away from their places of origin. Foreign tanners must know the quality of goods they buy and the only way of getting this knowledge is to buy hides and skins which have been graded according to a standard approved by the purchaser and the seller.

Grading is also in the interest of the seller. If he offers all round lots the price is often determined by the inferior hides or skins in the pack whereby the superior qualities do not fetch their proper values. A fair and equitable price is obtained when the goods are graded and sold on the basis of quality.

The outline of general methods and standards of grading.—Hides and skins of domestic herds and flocks are usually dealt in in the trade. In India, they consist of (1) cattle hides that is those of cows, oxen, bulls and calf skins, (2) buffalo hides, (3) sheep, and (4) goat skins. There is a distinct trade in each of these four descriptions of hides and skins. Apart from the broad differences that exist among these four classes there are great variations in the hides and skins of the same generic type. These differences arise from their basic physical qualities and also from defects caused to them by disease, bacterial infection, pest infestation and malpractices. Basic physical qualities are inherent from size, shape, smoothness, substance, thickness, weight, plumpness, species, breed, sex, age and the natural characteristics of the grain such as hardness, tightness and fineness.

Defects from diseases consist of such scars as are caused by sores, ulcers, dermatitis, pock marks caused by rinderpest, pimples, emaciation and loss of substance. Bacterial infection causes hairslip, grainslip and blisters. Insects and pests give rise to warble or grub holes, tick marks, etc. Malpractices cause goad marks, brand marks, dragging scratches. Defects such as sores and cuts from bad flaying, and those from defective curing also fall under defects due to malpractices and carelessness.

All these constitute the factors that guide classification and grading. A distinction must be made in India between classification and grading. In such a vast country great differences are observed in hides and skins due to their (1) place of origin, (2) weight and size, and (3) cure, which necessitate their classification or grouping on the above three bases, before grading into qualities can be attempted.

Classification on regional basis.—Hides and skins not only of different provinces, but of different districts of the same province differ widely in basic physical characteristics and defects. This has given rise to regional classifications. For instance cattle hides are classified into Agras, North-Westerns, Durbhargas, etc. Similar practice is followed in the case of buffalo hides, goat and sheep skins.

Classification on weight and size basis.—Hides are classified into heavy, medium and lights on specified weight basis. Skins are similarly classified on the basis of size into large, medium and small.

Classification on the basis of cure.—There are three principal methods of curing for preservation in India—Drying, Dry-salting and Wet-salting. This has given rise to three classes of hides and skins, viz., the dry hides (also called flints or the poisoned) and skins, dry-salted (or plaster-cured) hides and skins and wet-salted hides and skins. The dry hides are called flints because they dry up hard like stone and they are called poisoned because of their treatment with a solution of arsenic for protection against the ravages of insects. The dry-salted hides are also called plaster-cured because in curing they are plastered with khari salt which is a saline earth. Often to increase weight the khari salt is mixed with earth, chalk and other substances which produce a thick plaster on the flesh side of hides.

Grading.—Hides and skins of each variety (cattle, buffalo, goat or sheep) and each class (regional, weight, size and cure) are then graded into different qualities on the basis of quality factors which are—

Factors of grading.

1. The appearance of the hair.
2. The substance (whether plump, poor or thin).
3. Defects on the hair or grain side.
4. Defects on the flesh side.
5. Trim and pattern.

Hair.—Close shiny hair is an indication of quality. Hides and skins taken off from animals in winter show these characteristics of the hair. Hence winter hides and skins are preferred to those of the other seasons, and fetch higher prices. A healthy animal bears good body hair and yields a good pelt. Thin and dull hair indicates inferiority of the stock. The hair should also be firm and should not come off when pulled. If it does, it is a sign that putrefaction has started in the material, and this condition is known in the trade as hairslip. Tainted hides and skins showing hairslip come under the grades known as rejections and double rejections.

Substance.—A plump, well grown hide or skin which is full at the belly and flanks yields a superior piece of leather which is soft in feel and possesses a good cutting value. Hence substance is an important factor in assessing the quality of a hide or skin.

Hair or grain side defects.—A large number of blemishes are found on the hair side, e.g., hairslip, grainslip, holes, scratches, brands, goad marks, yoke marks, tar marks, horn marks, warbles, ticks, scales, etc. The number and intensity of these blemishes are taken into account in grading.

Flesh side defects.—Too much flesh, flaying scores, gouges, cuts, putrefaction damages, in the case of dry-salted hides too thick a plaster of the curing salt are the usual flesh side defects.

Trim and pattern.—The cutting value of a hide or skin is increased by its regular pattern. In flaying it should be slit down the centre of the belly, head pieces and some portions of the legs and tail should be cut off as they do not produce useful leather and if present would lower its cutting value.

Standard of grading.—In most important countries the standard is fixed by an understanding between buyer and seller. There are such standards in the United States, Argentine, Belgium, Germany, England, South Africa, Australia, New Zealand, China and India, etc. These standards are not all on the same level, some are high, while others are comparatively low. Generally those countries whose leather industries are greatly advanced and those which cater for them maintain high standards. In countries where the tanning industry is backward and whose hides and skins are not demanded to any great extent by advanced tanning industries there is either no grading at all or grading is on a loose and low standard. The standard of grading also depends on the general average quality of the goods available in a particular country. It is no use aiming at a very high standard when the stocks available for grading are intrinsically of a mediocre or low quality. If this is done the higher qualities will either be insignificant in volume or conspicuous by entire absence.

Specifications of standard.—In fixing a standard, specifications have to be made as to the nature, number and position of the defects that are to be tolerated in each grade. Number, nature and positions of defects are all important factors. A defect may be harmless if it is only slight and situated on the belly or at the edge of the butt, because the cutting value of the leather is not much affected thereby. But if that defect is deep and located in the centre of the hide it becomes harmful and cannot be overlooked. Specifications should include the portions that are to be trimmed off, the pattern that should be given to the hide or skin, and the amount of flesh that may be allowed to remain on it for a particular grade.

Number of grades.—This is another consideration. The number should be such as to be able to include all available stock in a particular variety and class that can be marketed. In most countries there are usually 4 grades, first or primes, seconds, thirds and rejections. Firsts are flawless hides or skins, seconds have a number of defects which reduce the cutting value to a certain extent but not necessarily the quality of the final leather. The thirds have more defects than the seconds which

not only reduce the cutting value appreciably, but also, the quality of final leather. Rejections are damaged or rotten hides and skins which are often not worth tanning at all and turned into glue.

In India the trade in hides and skins falls under two broad divisions, the export and internal. The export trade is handled by firms which are known as hide and skin exporters or shippers. They are mostly big and have organisations in India for purchasing from different centres of production throughout the country, for preparing, grading and baling the goods for export and distributing them in overseas markets. The Indian hide and skin export trade is of long standing international status and is in the closest possible contact with the most advanced leather manufacturing countries of Europe and America. The value of the annual export of hides and skins from India was about Rs. 12 crores in pre-war days and is about Rs. 4 crores at present. Catering as they do for the advanced tanners of the West the Indian hide and skin exporters have to maintain rigid standards of classifications and grading which they have evolved from long experience.

Export classifications and grading of cow and buffalo hides.—Usually dry and dry-salted hides are exported giving rise to two broad classes on the cure basis. The dry hides are subdivided into (1) the arsenicated framed, and (2) arsenicated unframed or crumpled. The arsenicated framed are again of 2 kinds, one being stretched lengthwise (Agra cure) and the other stretched breadthwise (Purnea cure).

The dry-salted hides are subdivided into two classes, heavily cured or plastered and lightly cured. The former are called Daccas and the latter Meherpurs. The name Meherpur was in use formerly, now it has been replaced by the term "Chitkhari" which means lightly cured with khari salt.

On the basis of weight, hides are divided into calves, lights, mediums, heavies and extra heavies according to weight ranges specified by the trade. For instance in the case of dry cow hides these weight ranges are—

Calves	.	.	.	.	.	.	.	.	Under 2 lbs.
Lights	.	.	.	.	.	.	.	.	2 to 7 lbs.
Mediums	.	.	.	.	.	.	.	.	8 to 12 lbs.
Heavies	.	.	.	.	.	.	.	.	13 to 16 lbs.
Extra heavies	.	.	.	.	.	.	.	.	Over 16 lbs.

There are similar specifications for dry-salted cow hides and dry and dry-salted buffalo hides. In trade contracts, however, weight limits and average weights are specified.

On the basis of quality the hides are classified into five grades :—

1st grade called Slaughters, distinguishing abbreviation	.	.	" S."
2nd grade called Deads, distinguishing abbreviation	.	.	" D."
3rd grade called Rejections, distinguishing abbreviation	.	.	" R."
4th grade called Double Rejections, distinguishing abbreviation	.	.	" R. D."
5th grade called Triple Rejections, distinguishing abbreviation	.	.	" R. T."

In the slaughters again, distinction is made into Kurbanies, Commissariats and ordinary slaughters. Kurbanies are hides taken off from animals that are sacrificed at the annual Muhammadan festival "Bakrid" in which well-fed and well-developed cows as far as possible without any blemishes on the hide are killed. These hides are denoted in the trade by the letter "K" put at the end of the abbreviation representing the class and the grade. Commissariats are hides from the slaughter houses maintained by the Military Department of the Government of India. These hides are of good quality and are represented by the letter "C". Ordinarily slaughtered hides are obtained from the city and municipal slaughter houses or from animals slaughtered in private houses in villages. A hide from fallen cattle may also be classified as a slaughter if its nature and characteristics make it sufficiently good for classification in the first grade. Similarly a slaughtered hide if it is defective is classed as Dead.

For classification and grading of Indian cow hides (kips) and buffalo hides the export trade follows the specifications prescribed by the Hamburg Chamber of Commerce. These are given below—

Specifications of the assortments of East India Kips and Buffalo hides as laid down by the Hamburg Court of appeal for business (Hamburger Berufungskammer für Geschäfte).

(In force from 1st July 1934.)

1. *General*.—All Calcutta firms must sort out and mark according to a uniform principle.

2. *Preparation*.—(i) Good arsenicated kips, Agras and North-westerns must be free from head. The feet must be cut off directly under the knees.

Purnea and real Durbhangas should be delivered with pointed heads, in other respects they must be as stated above.

(ii) Uncrumpled Durbhangas and Daisies may have cheek pieces in up to 50 per cent. of the goods. The feet shall be cut off between the knee and the hoof.

(iii) Crumpled Patnas and Bazar Arsenics must be delivered free from claws. Cheek pieces are allowed on them without mouth, eyes and ears.

(iv) The Double rejections should be delivered absolutely free from hoofs.

(v) Plastered kips like Daccas and Real Meherpurs should not have any thick coat of plaster and much flesh, and should be delivered with pointed heads. The feet must be cut off close under the knee, but in this cutting a small amount of tolerance is allowed.

(vi) Plastered hides should contain hides which have been recured according to trade practice.

3. *Sorting and Marking*.—(a) *Arsenicated*.—AACCS/A.—Very well prepared preferably lengthwise stretched Commissariat hides absolutely clean fleshed with plain, light flesh sides, free from cuts and as far as is possible to see in the raw state free every hair defect and warbles.

AACS/A.—Well prepared, fleshed, substantial hides with absolutely plain flesh sides, without open warbles; small unimportant hair defects are tolerated; without deeply scored (cuts and butcher marks) hides.

AAS/A.—Absolutely plain flesh side, on the hair side not so good, as AACS. This should be an intermediate assortment between slaughters and deads. Hides with five noticeable warbles and with a small rub mark on one side are admissible.

AACD/A.—Absolutely plain flesh side; a small proportion of the hides with up to 10 visible warbles admissible and a proportion with rub marks allowed. With regard to the hair selection it should be according to the grade.

AACR/A.—Flesh side must be plain. With regard to preparation and assortment lower than AACD/A.

AACCS, AACS, AAS, AACD, AACR, AACRD.—The sorting should be exactly like the sorting of the superior grades, only somewhat darker and not quite so clean on the flesh side. The hair selection should be of the usual standard.

AACS/NW, AACD/NW, AACR/NW.—These should be of exactly the same preparation as Agras, a certain proportion being broader and flatter, not so clean on the flesh and generally of a dull appearance. With regard to rub marks and warbles as well as other defects, they should correspond to the Agra selection.

PRACS, PRACD, PRACR, PRACRD.—Substantial, mostly breadthwise stretched hides, only from Purnea and Durbhanga districts, without warbles, with plain flesh side, with little or small flesh fibres. Hair and flesh sides according to corresponding grades.

PLACS, BDACD, RDACR.—Substantial, some broad, some lengthwise stretched hides, mostly from Purnea, Durbhanga and neighbouring districts; flesh sides more often somewhat dark and some thin pieces of flesh allowed. The hair and flesh sides according to corresponding grades, without warbles.

DACS, DACD, DACR, DACRD.—Mostly broadly prepared, substantial and hides of medium substance without warbles. On the flesh sides on an average not so clean as the real Durbhangas, certain portions somewhat crumpled. The hair and flesh sides according to corresponding grades.

DPS/A, DPD/A, DPR/A, DPRD/A.—Hides of diverse provinces somewhat flat and thin, without much flesh. A small proportion somewhat crumpled but for that reason with proportionately cleaner flesh sides. Hair and flesh sides according to corresponding grades.

DPS, DPD, DPR, DPRD, DPRT—Mostly substantial shrivelled up hides of different localities and assorted without regard to pattern. With somewhat thick flesh and to a certain extent earthy cure, hair and flesh sides, according to corresponding grades.

(b) *Plastered hides.*—*Daccas*—BCS, BDS, MDS, MDD, DRD, DRT, BCS/K, BDS/K, MDS/K—Kurbanics as such may be shipped only in weights up to 12 lbs. Hides of proper preparation, up to 25 per cent. heavily salted, with small flesh remnants but with the exclusion of too fleshy and too heavily salted bazar quality.

Real Meherpurs.—RMS, RMD, RMR, RMRD—Mostly substantial hides and on an average of clean flesh sides with only thin plaster. Some small flesh or a light plaster cannot always be avoided in these hides.

Meherpurs.—MS, MD, MR, MRD—Meherpurs and hides similar to them the Burdwans, etc., with heavy plaster with or without flesh.

Salted Agras.—SACCS, SACS, SAAS, SACD, SACR, SACRD—Hides from Agra and North-Western districts with light coat of salt. Hair selection analogous to Agra arsenics.

All grades are without mouth, eyes and hoofs with the exception of double rejections.

All signs like L for lights, M for medium weights and H for heavy weights are cancelled.

Calf skins shall be marked exactly like cow hides.

(c) *Buffaloes.*—*Arsenic Agra buffaloes.*—AABCS, AABS, AABD, AABR, AABRD—These special grades which have been in vogue hitherto are kept.

Arsenic Purnea, Durbhanga buffaloes.—PRDABS, PRDABD, PRDABR, PRDABRD.

Arsenic common buffaloes.—ABS, ABD, ABR, ABRD.

Dacca buffaloes.—For the Dacca buffaloes the marks of individual exporters which have been in vogue so long are kept intact.

4. Weight limits.—

Lights hides up to 9 lbs.	about 2 lbs. more or less.
Hides between 9 and 16 lbs.	about 3 lbs. more or less.
Hides over 16 lbs.	about 4 lbs. more or less.

5. *Contract.*—Every arsenic contract must mention the goods either as winter or summer. In case of mixed lots the percentage of winter goods in the lots must be mentioned.

6. *Number of hides in the bale.*—The shipping in future should be made in uniform numbers as given below:—

(i) Cow hides—

Up to 2 lbs.	500 pieces per bale.
Over 2 to 3½ lbs.	300 ditto.
Over 3½ to 6 lbs.	200 ditto.
Over 6 to 9 lbs.	150 ditto.
Over 9 to 12 lbs.	125 ditto.
Over 12 to 18 lbs.	100 ditto.
Over 18 to 20 lbs.	80 ditto.
Over 20 lbs.	60 ditto.

(ii) Buffalo hides—

Up to 3½ lbs.	300 pieces per bale.
Over 3½ to 6 lbs.	200 ditto.
Over 6 to 9 lbs.	150 ditto.
Over 9 to 12 lbs.	125 ditto.
Over 12 to 16 lbs.	100 ditto.
Over 16 to 18 lbs.	80 ditto.
Over 18 to 22 lbs.	60 ditto.
Over 22 lbs.	50 ditto.

If it be the wish of the shipper to ship continuously bales containing a smaller number of hides than what have been given in the above table the association should be informed about the exact numbers in the bales.

Export classifications and grading of goat skins.—Like cattle hides, goat skins are classified on regional, and cure basis. But unlike cattle hides they are also classified on the basis of size instead of weight. Each class is then graded on the basis of approved quality factors.

Regional classes.—There are many regional types. Almost every district in the producing centres has a type of its own possessing distinct physical qualities such as grain, substance and area which are recognised by the trade. The primary quality required in goat skins for the production of shoe upper leather "glace kid" is fineness of grain and Indian goat skins vary considerably in this respect according to the district of origin. The Bengal and Bihar goat skins are fine grained and small in area, hence they are used for the manufacture of glace kid and fetch higher prices than those from other localities. The Punjab, United Provinces and South Indians skins are coarser in grain. The following regional types are recognised in the trade :—

- (1) Amritsars, (2) Delhi-Agras, (3) Lucknows, (4) Cawnpores, (5) Muzaffarpores, (6) Patnas, (7) Durbhargas, (8) Caloutta kills, (9) Daisies, (10) Kusthians, (11) Daccas, (12) Dinajpores, (13) Madras, (14) Coconadas, (15) Coimbatores, (16) Dindiguls, (17) Trichinopolis, (18) Malabars, (19) Hyderabad and (20) Deccans.

Classification on cure.—Dry, dry-salted and wet-salted are the three classes. The majority are dry-salted.

Classification according to size.—Measurement is done from the nape of the neck to the root of the tail.

Extra heavies	. . . . .	40" and up.
Heavies	. . . . .	36"—40".
Mediums	. . . . .	33"—36".
Lights	. . . . .	28"—33".
Kids	. . . . .	Below 28".

Grading on quality basis.—Each class of skins is graded into (1) Primes, (2) Seconds, (3) Rejections (Fortas), and (4) Double rejections. The factors of grading are hair, substance (pelt) and such defects as warbles (pokas), Danas (Borsatis), sores, ulcers, scabs (kharisthas), hair-slips, scratches, etc. There are well recognised specifications for grading which the exporters follow. Standards of grading, however, slightly differ with different exporter.

Sheep skins.—Similar classification of grading are also done for sheep skins.

All the important factors that deserve consideration in the classification and grading of the Indian hides and skins have been taken into due consideration in the exporters' system of grading. One particular feature that should be emphasized here is that the grading is done by the shippers when hides and skins are brought to their warehouses (godowns). They also grade, at dealers, or aratdars' places but only to get an idea as to the price they should offer to lots under negotiation. In the market the shippers purchase all round lots. Aratdars and dealers do not grade, neither do they sell on a grade basis and therefore, do not get the economic advantage that grading would give them, if they applied the shippers' grading system in their trade practice. It is true that many dealers or beparis as they are called bring only small lots for sale which are too small for grading but this is not the case with big aratdars who more often than not handle very large stocks.

Selectors.—Grading of hides and skins is an art which has to be acquired by long practice. In the export trade selectors have been trained. They are called "jachandars." They are employed by the exporters. Dealers and aratdars do not know grading themselves and neither do they utilize the services of "jachandars." If they cared to do it they would be easily able to apply the exporters' grading systems in their business for the benefit of all concerned.

The Internal trade.

In the internal trade tanners in India are the purchasers, and the sellers, as in the case of the export trade, are the butchers in the slaughter houses, the dealers and the aratdars. Tanners in India fall into two broad groups, the half-tan leather tanners of Madras known as Madras tanners and the chrome tanners. While Madras tanners buy dry, dry-salted and wet-salted hides and skins the chrome tanners usually purchase the wet-salted ones principally. Neither of them follow any agreed system of grading but buy on inspection. At the slaughter houses hides are bought on the animals' backs before the beasts are killed judging the quality from the sight of the animals. At arat they inspect lots at the time of purchase. Some grade the hides and skins according to their own standards while others only make a rough judgment in their own mind after inspecting the hides and skins about the average quality of lots so inspected. It is the most haphazard way of buying. Tanners do not employ trained selectors or "jochandars." If they did, it would not be a difficult matter for them to apply the exporters' grading system at any rate in the purchases they make from the arats.

The principal markets from which Indian tanners buy wet-salted hides and skins are Cawnpore and Calcutta. Hides and skins of Northern India come to Cawnpore and those from Bihar and Orissa, Bengal and Assam to Calcutta. In each of these markets rough classifications are made on a regional basis.

In Cawnpore, cow hides are classed as Pacchams (Western districts) and Purabs (Eastern districts). The former are superior. Pacchams again are classified as Rampures, Barrielies, Meeruts, Agras, etc. In Purabs such as Benares, Allahabad, Jabhalpores are distinguished. Rampores and Barrielies have the best reputation and usually fetch the highest prices. Messrs. Cooper Allen & Co. sort the hides at the time of purchase into different grades and offer a different price for each grade. But this practice is not followed by other tanneries.

There are similar regional classifications for buffalo hides, goat and sheep skins in the Cawnpore market. Considerable quantities of buffalo hides are also bought from Peshawar, Lahore, Delhi and Agra.

In the Calcutta market the following classes are distinguished for cow hides :—

- (1) The slaughter house hides (Green).
- (2) Wet-salted Bihar and Ranchi hides at the Colootola market.
- (3) Wet-salted hides from Bengal and Assam at the Narkeldanga market.

Slaughter house hides.—These are obtained from the Tangra, Matiahruz, Howrah and Barrackpore slaughter houses.

In the Tangra slaughter house the hides are roughly graded as follows in order of quality :—

First class—Nagoras; Second class—Nagotas, Bhagalpuris, Deshis, Hatuas and Bulls. In the other slaughter houses only two classes are made, good and rejections.

Wet-salted hides in the Colootola market (Bihar hides).—The following is the recognised order of quality :—

Dinapurs, Durbhanga slaughters, ordinary Durbhanganas, Bhagalpuris, Biharr, Patnas, Gayas, Purnens, Kishengunges and Ranchis.

Narkeldanga market (Bengal and Assam hides).—Slaughters (wet-salted slaughter house hides), Daisies (Burdwans, Hooghlies, 24-Parganas, etc.), Rungpores, Bogras, Dinajpores, Maldahs, Serajgunjs, Murshidabads, Naccas, Chittagongs and Assams. This list is not strictly in order of quality.

Classification on the weight basis.—On the basis of weights the wet-salted hides are classified as follows :—

	Bihar hides. lbs.	Bengal hides. lbs.
Heavies	20—30	14—20
Mediums	10—20	10—13
Lights	6—9	6—9
Calves	3—5	3—5

Indian and European chrome tanners buy medium, lights and calves of the better qualities. The Chinese chrome tanners buy the heavies from both Colootola and Narkeldanga markets.

Classification on quality basis.—The wet-salted hides are classified on quality basis into the following grades :—

- (1) Superiors, suitable for chrome tanning.
- (2) Mediums for bark tanning.
- (3) Rejections.
- (4) Double rejections.

Rejections and double rejections are sold to the chamars who make varnish leather from them. Buyers are allowed to sort the superior and medium grades and if they find any rejections in them they are allowed to take them out and put them in rejections.

Buffalo hides.—In the Calcutta market for the internal trade buffalo hides are sold in the green, wet-salted, dry-salted and dry condition. The bulk of the trade is in wet-salted buffaloes. The following are the principal types available in the Calcutta market :—

- (1) Tangra Slaughter House buffalo hides (green).
- (2) Wet-salted Bihar buffalo hides which in order of quality are Dinapores, Durbhangas and Ranchis.
- (3) Wet-salted Assam and Bengal buffaloes. The Assam hides are better, the Bengals are inferior.

Classification in weights.—

Heavies	.	.	.	.	.	.	.	.	50 lbs. and up.
Mediums	.	.	.	.	.	.	.	.	40—50 lbs.
Lights	.	.	.	.	.	.	.	.	25—40 lbs.

Quality classification.—Good and rejections.

Goat skins.—Regional types in the wet-salted goat skins are Kushtias, Calcutta kills and Daisies.

Most of the goat skins bought for tanning in India are Rejections and Double rejections. The better qualities are all exported.

A suggested system of classification and grading for the internal trade.—To put the internal trade on a uniform grading system the first thing necessary is to specify grading factors for the different types of hides and skins that enter into this trade.

The tentative grades and classifications that have been drawn up at the Conference of representatives of Indian tanners and the Central Marketing staff for slaughter house hides and skins should be given a fair trial. But this only touches the fringe of the problem.

Bulk of the hides and skins come from outside slaughter houses. For these, classifications and grading specifications may be made on the lines of the exporters' systems.

Regional, weight and size classifications which prevail in the export trade can easily be adopted by the internal trade. Each of the regional, weight and size classes should have selection factors for grading. Such selection factors are suggested below for the wet-salted cow hides, buffalo hides, goat and sheep skins.

Selection factors for wet-salted cow hides.—*Firsts.*—Good substance, long glossy hair, without any grain or flesh defects. Well salted with clean common salt.

Seconds.—Of comparatively poor substance in the offals. Not more than three unimportant grain defects. Not more than three shallow flay marks in the offals. Well salted with clean common salt.

Thirds.—Defective hides which are not rejections. Well salted with either common or khari salt.

Rejections.—May have the following defects :—

- (i) Slight hairslip showing incipient putrefaction.
- (ii) Small localised brand marks.
- (iii) Excessive pock or tick marks.
- (iv) Sores, excessive cuts and flay marks.

Double rejections.—

- (i) Heated hides showing excessive hairslip, or grainslip or both.
- (ii) Whole surface covered with brand marks.
- (iii) Damage by vulture.
- (iv) Very badly infested with ticks.

Selection factors for wet-salted Buffalo hides.—*Typical regional classifications.*—Calcutta slaughters, Durbhargas, Assams, Gayas, Ranchis and Bengals.

Weight classifications :—

Heavies	. . . . .	50 lbs. and above.
Mediums	. . . . .	40—50 lbs. (45 average).
Lights	. . . . .	20—40 lbs. (30—35 lbs. average).
Katais	below 20 lbs.	

Quality classifications.—*Firsts.*—Well trimmed, cleanly fleshed hides of good substance of she buffaloes without grain or flesh defects. Well cured with clear common salt.

Seconds.—Well trimmed hides of fair substance with unimportant grain or flesh defects. Hides of male buffaloes allowed. Well preserved with common salt or khari salt.

Rejections.—Hides of he or she buffalo showing the following defects :—

- (i) Slight hairslip.
- (ii) Sores.
- (iii) Localised small brand marks.
- (iv) Pock and tick marks allowed.

Double rejections :—

- (i) Badly heated.
- (ii) Excessive brand marks.
- (iii) Vulture marks and other defects.

Selection factors for wet-salted goat and sheep skins.—*Quality classifications.*—*Primes.*—Good substance without any grain or flesh defects, well salted with clean common salt.

Seconds.—Good substance, unimportant defects or defects on unimportant parts such as bellies and legs allowed. Salted with common salt.

Thirds.—Fair to poor substance, a few defects on grain and flesh allowed which do not affect the intrinsic quality of leather but decreases its cutting value.

Rejections.—Slight hairslip, cut and flay marks allowed.

Double rejections.—Heated. Cuts and other defects allowed.

These suggestions only show the lines along which the selection factors for wet-salted hides and skins should be fixed. Fixed specifications should be decided upon by a conference of the representatives of Indian tanners, hide and skin dealers, shippers and the Central Marketing Board.

Development of the hide and skins industry.

Development of the hide and skin industry in India pre-supposes two things (1) improvement of the available supply and (2) introduction of better system of collection and marketing. There are no doubt certain inherent defects in Indian raw hides and skins, but there are many remediable defects which can be avoided by

paying a little more attention to the animals and taking a bit more care in flaying and curing the hides and skins than is done at present. The more common remediable defects are mentioned below.

Defects due to inattention or lack of sufficient attention to the animals.

- (i) Warble holes.
- (ii) Pock marks.
- (iii) Tick marks.
- (iv) Jungle scratches.
- (v) Marks due to various skin diseases.
- (vi) Thin substance due to malnutrition.

Defects due to rough handling of the animals by the owners—

- (i) Brand marks.
- (ii) Goad marks.
- (iii) Yoke marks.

Grain and flesh defects due to inattention or want of skill in flaying hides and skins—

- (i) Drag marks or "ragar".
- (ii) Butchers' cuts.
- (iii) Flay marks.
- (iv) Vulture scratches in case of animal dying a natural death and thrown in village "bhagars".
- (v) Thick plaster in dry salting.
- (vi) Keeping lot of flesh on hides.
- (vii) Bad trimming, e.g., keeping hoofs, horns, etc.
- (viii) Excessive stretching of goat skins to increase the length thereby making breaches on the grain.
- (ix) Putrefaction due to insufficient or too late curing.
- (x) Stitching and patching up to conceal cuts.

The Hide Cess Enquiry Committee (1929-30) estimated that India sustains a loss of about 3 to 4 crores of rupees annually for these remediable defects in Indian hides only. The loss must be similarly great in skins. The possible methods of combating them have been discussed in the Committee's report which need not be reiterated here. If organised efforts are made to their removal the quality of Indian hides and skins will considerably improve and India will be saved of the huge economic loss referred to.

Introduction of the grading system in the internal trade will also do a great deal in improving the trade.

Summary of the note.

It is necessary to grade raw hides and skins because the tanners require to have an idea of the type and quality of leather they will get from the hides and skins they buy. It is only when the hides and skins are graded that the foreign tanners can know what to order. Grading is also to the interest of hide and skin dealers because they can get the best and the most equitable prices for graded hides and skins.

In India, classification of hides and skins is done on regional, weight, size and cure basis and grading on quality factors.

The Indian hide and skin trade falls under two broad divisions, export and internal. The export trade has a well organised and rigid classification and grading system which is of a fairly high standard. The internal trade has none. A scheme of grading for slaughter house hides for the internal trade has been recently drawn up by a conference of representatives of Indian tanners and the staff of the Central Marketing Board. In the present note a scheme for grading wet-salted hides and skins for the internal trade is suggested.

APPENDIX XX.

NOTE ON SUBJECT No. 22, BY COL. A. OLVER, ANIMAL HUSBANDRY EXPERT, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

The position as regards the salvage of cows in Calcutta City appears to be as follows :—

Roughly there are 9,000 good young cows, mostly Harianas and Sahiwals, slaughtered in Calcutta every year which would be worth salvaging.

They at present fetch Rs. 30—60 and even higher prices from butchers in Calcutta if in good condition. This information was supplied by the Marketing Officer, Mr Bee, and has been confirmed by the Live Stock Officer, Bengal.

According to the marketing staff the price of a dry Hariana cow in Delhi Province and Rohtak is roughly from Rs. 30—60; according to age, its previous milking performance and whether it has been served or not.

Hence a dry cow is worth as much in Calcutta as in Delhi and cows which have been in a city dairy and which if served have probably been mated with a very inferior non-descript bull are not wanted by Hariana breeders. Moreover Phuka is stated to be very commonly practised in Calcutta and such cows are regarded with suspicion as the practice is considered to render them difficult to breed from or even permanently sterile. As to the truth or otherwise of these allegations I have been able to obtain no reliable information as there is apparently no means of telling if a cow has been phookad or not.

The fact that cows in Calcutta are not usually served while they are in milk also has a tendency to make them difficult to get in calf afterwards and it is considered by the Live Stock Officer, Bengal, that of dry cows purchased from city dairies in Calcutta, roughly 20 per cent. would prove to be sterile while on the average the remainder would take 16 months from the time of purchase to produce another calf. If no more than 20 per cent. are sterile it seems that the prevalence of phooka or its effects must have been exaggerated, since in any case a certain number of cows would probably be sterile after a lactation period spent in a city under the usual insanitary conditions.

It would thus not be a sound proposition for a businessman to attempt to maintain cows in Calcutta or to transport them as far as Delhi or Rohtak with a view to eventually bringing them back for milk production in Calcutta. Though it might pay a financier or a Government to buy them with a view of thus obtaining good cheap cows for breeding purposes.

In this connection it must not be overlooked that the cost of bringing cows back does not end with the freight charge. In addition the expense per animal is considerable in such matters as fodder, attendance, and all sorts of incidental expenses, e.g., to obviate having them held up at junctions and sidings.

That being the position it appears to me that any action taken to remedy this evil must take the form of doing every thing possible to develop a milk supply, to all big cities, from outside area where normal dairy farming could be carried on; the cows being regularly bred from as long as they will breed and the calves reared under normal healthy conditions.

This is being attempted in Bombay by the allotment of an area outside the city, for dairying and fodder production, and something of the same sort is under consideration by the Live Stock Officer, Bengal, and the Director of Veterinary Services working in collaboration. But before dairy farming can be made to pay, in areas where special fodder crops have to be grown for them, on irrigated land, and the milk sent into a city, it is essential that high yielding dairy cows should be systematically bred and that the dairy farmer shall be protected from unfair competition from city milk vendors who in present circumstances have only to add a little more water to be able to undersell sound milk, however much the cost of production may be reduced.

Effective prevention of the adulteration of milk and dairy products of all kinds in big cities is in fact the crux of the whole matter. Until that is provided for it will be impossible to develop sanitary dairying on modern lines in natural dairy tracts outside big cities.

The necessary laws and regulations exist in most big cities, but owing to the leniency with which they are administered and the inadequacy of the arrangements for inspection and testing of milk and dairy products, they are mostly a dead letter. Pending effective action in this respect all that can be done is to save as many as possible of the good young cows which are at present sold daily in Calcutta for slaughter and some action has already been taken in this direction. For example while in Calcutta I visited the principal Pinjrapoles and was informed that they had made up their minds to work in future on the lines which have been followed in several Pinjrapoles and Gowshalas and at the Delhi Pinjrapole for years. The proposal which was referred to in the Viceroy's scheme for Cattle Improvement is to mate all their good cows with good milking type bulls and to carry on systematic milk recording and pedigree registration in connection with the supply of milk and butter to the city, under proper supervision.

Extra land is to be acquired outside the city where fodder crops can be grown and where dry and dordet stock can be cheaply maintained under natural, healthy conditions and already these Calcutta Pinjrapoles have taken up the amendment of their bye-laws so that the surplus young stock can be disposed of, for breeding or work under suitable conditions.

Suitable young bulls have already been bought in the Punjab and action is now being taken to build up milking herds by purchasing good young cows in the city which would otherwise be sold to the butcher. These pinjrapoles have a total income of several lakhs of rupees a year and it may be anticipated that they will, every year in future, save a number of good dairy cows from slaughter. In addition they should produce milk and butter under very satisfactory conditions and in time provide pedigree Haryana and Sahiwal bulls and heifers for breeding.

Further it is now proposed to supply prison dairies with suitable young cows purchased in Calcutta so that they also can be utilised for the improvement of cattle in the province.

Moreover a scheme is being prepared, by the Director of Agriculture and the Director of Veterinary Services, Bengal, in collaboration, to endeavour to develop a dry stock area in one of the most suitable districts of Bengal, where dry cows could be cheaply maintained under healthy conditions and got in calf again so that they could be sent back to the city for milk production, if desired. The calves and the best of the cows would no doubt be retained in this area and utilized for the improvement of local cattle.

Largely owing to the long time it would take to get city cows in calf again and the number of failures which may be expected, this is not likely to prove a paying undertaking for Government but if properly worked it should prove a cheap way of obtaining good young stock for the improvement of local cattle. Under such a scheme the cost of saving even 1,000 cows a year would however be considerable and may be prohibitive.

In addition to the above I have recommended the Bihar and Orissa Governments, and certain Indian States within easy reach of Calcutta, to consider the possibilities of working on similar lines for the improvement of their cattle. To buy equally good foundation cows from the Punjab and land them in Calcutta would cost on an average roughly Rs. 200 each, so it should pay to buy good young cows in Calcutta and breed from them with suitable bulls for the benefit of the cultivators of such provinces or States.

In dealing with this matter a very important consideration which should never be lost sight of is the danger of placing any drastic restriction on the export of cows from their natural breeding areas since it is a very well authenticated fact that, given experienced breeders, the greatest possible incentive to improve any kind of livestock is a good market.

The valuable export trade in pedigree cattle, which England has been able to build up and hold for so many years, could never have been developed but for her very remunerative export trade with America and other countries which enabled breeders to breed and feed the best. Moreover after the Veterinary Department had succeeded about the middle of last century—in stamping out and keeping out of the British Isles all the most important fatal plagues of live-stock, such as Rinderpest and Contagious Pleuro *Phcymonia* they were able to carry on their breeding operations from generation to generation without serious risk of loss from disease.

India the same principles apply, provided that breeders are alive to the necessity of always retaining sufficient of their best strains to maintain the quality of their stock and judging from such figures as I have been able to obtain it appears that this is the case in the Punjab so far.

Such figures as I have of the yields of purchased cows in Punjab markets do not in fact support the statements which are constantly made that their average milk yield is rapidly falling. Thus unless and until there is well authenticated evidence of this it would be a great mistake to place any difficulties in the way of export of cattle from breeding areas, as was done in the case of the Ongole and Kankrej breeds with deplorable results.

Since writing the above I have visited Bombay and Madras and the position appears to be as follows:—

In Bombay very few cows are used for milking purposes except a small number maintained by private individuals or for the feeding of children and invalids. I visited the Slaughter-house at Bandra and did not see a single good milch cow offered for sale though there were a number of she-buffaloes, some of which would probably have been worth saving for breeding if better facilities were available. Approximately 44,000 cattle are slaughtered every year in Bombay, but the type of animal slaughtered for meat is, as a rule, a very poor one which would not be worth retaining for milk production or for work. I saw large number of them at Bandra and they were all very poor animals the price of which varied between Rs. 15—17 each. But the milk supply of Bombay is almost entirely from buffaloes and I was informed that, in view of the expense and difficulty of obtaining high-yielding buffaloes, more and more are now being taken back to grazing areas by their owners or dealers who make a business of this. This movement is being assisted in two ways. (1) by a charge of Rs. 15, which is now made on every buffalo slaughtered at Bandra slaughter-house and (2) by the reduction in railway freight from 4 annas per truck per mile to 3 annas, which is now allowed by the B., R. and C. I., from June until October, for the transportation of dry cow-buffaloes back to breeding areas up to distances of 340 miles. The number of buffaloes slaughtered in Bombay was previously about 26,000 a year, but last year fell to 16,000 and there are records of 3,000 cows having been taken back to breeding areas by rail. This concession seems to be a very useful one and I suggest that still more good cows might be saved if the rate were reduced to 2 annas per truck of dry cows for the journey out from Bombay, but it is of no use to attempt to save cows which are not first class milkers. Since the high cost of maintenance in a city dairy makes any but the best uneconomic. If the Railway consider that they cannot afford such a heavy reduction they might perhaps make a higher charge for the return journey. Owners should not object to paying at a higher rate on a cow in full milk, worth anything from Rs. 200 to Rs. 250, while they might hesitate to pay even 3 annas per mile on a truck load of dry cows not be worth more than Rs. 50 each. The higher cost of freight on cows in milk delivered in a city would tend to increase the difference in their value and that of a dry cow which would be no disadvantage from our point of view.

Whether the charge of Rs. 15 per buffalo slaughtered, against Rs. 1-8-0 per cow or bullock, has much effect it is somewhat difficult to say because it is still possible for owners to walk their buffaloes to slaughter-houses outside the City. This would however entail extra trouble and expense and it is doubtful if such good prices would be obtained for slaughter outside the city as in the city abattoir.

As previously mentioned an attempt has been made for years to organise a dairy district at Palghar, about 70 miles outside Bombay, for the supply of milk to the City, but I ascertained that though this proposal has been under discussion ever since 1878 nothing has so far been settled. Some of the highest milk producers in Bombay are interested but the competition of the licensed milk vendor, who for a license of 8 annas a year is allowed to sell milk anywhere in the city and the difficulty of getting satisfactory transportation facilities to enable milk to be delivered in Bombay sufficiently early and in good condition makes the development of such an area difficult in present circumstances.

In fact, as in Calcutta, the crux of the whole matter is proper control of the sale of milk and dairy products in the city.

At present all that can be done to a vendor who is caught selling adulterated milk is to order him to appear before a magistrate. In a large number of cases they do not appear and simply leave the district in which they have been operating, or if they appear being regarded as poor men, the fine imposed is so small as to have little

or no deterrent effect. The only way of overcoming this difficulty would be to license the producer whose milk is being sold and to hold him responsible for the vendor, who should be his paid servant. If that were done and adequate arrangements made for constant inspection and suitable punishment of offenders it should be possible to enable reputable producers to organise milk production within a reasonable distance of all big cities; provided that suitable facilities were given for the transportation of milk.

This is I believe the only real solution of this problem of cow slaughter.

In Madras the position is somewhat different but the same principles apply. Most of the milk consumed in the city is obtained from cows considerable numbers of which are maintained in city byres. These are mostly of the Ongole breed and a considerable number of these are now taken back to Nellore for breeding purposes under a concession rate of Rs. 10 per cow. A number are however slaughtered in the city for beef and it is probable that more good cows could be saved if better facilities existed for developing dairying within reasonable distances of the city.

Buffaloes are not as a rule used for milk production in Madras, mainly because the local buffalo is a poor dairy animal, but certain organisations such as the Madras Co-operative Milk Union obtain high-yielding Murra and other buffaloes from the North and maintain them short distances outside the city. Such buffaloes are very costly in Madras and would not be slaughtered as long as they were useful for milk production.

So long as cows are permitted within city limits another measure which would help to get them back to breeding areas would be to provide good bulls of milch types suitable for mating with such cows. At present all kinds of scrub bulls are allowed to wander the streets and serve cows indiscriminately with the result that the calf is not likely to be of much value. This does not matter much under the present system where the majority of the calves are allowed to die but if encouragement were to be given to city owners to send their cows back to areas where good cattle are bred it would be necessary to make provision for the cows to be served at the proper time by suitable bulls, so as to shorten the dry period and to provide calves which would be worth rearing. But in any case this would not save calves brought into the city. The majority of these would be allowed to die and for that reason alone every effort ought to be made to remove all commercial dairies from within city limits. They are grossly insanitary and owing to the high rents charged per buffalo they must I think have the effect of interfering with the provision of suitable accommodation for human beings.

For example the rent charged for dairy standings in Bombay City amounts to from Rs. 7 to Rs. 12 per standing per month, whereas outside it would be only Re. 1 or Rs. 2. The charges for food, water and servants are also much higher in the city and it is clear that, but for unfair competition by adulterated products, it should be much cheaper to produce milk, outside and to bring it in daily. Moreover, the daily transportation of large quantities of milk from the mofussil to cities should be an important source of revenue to the railways; for greater than the transportation of fresh cows or buffaloes once in 9 months. It should therefore pay railways in India to provide facilities for the development of dairy areas outside all big cities, on lines similar to the provision which is now-a-days made by Railway Companies in all progressive countries.

APPENDIX XXI.

NOTE ON SUBJECT No. 23, BY MR. E. J. BRUEN, LIVESTOCK EXPERT TO THE GOVERNMENT OF BOMBAY.

The Wool and Hair Industry in India, from the growing of the wool to its ultimate purchase by exporters, is in the hands of a very poor class of persons. Being as it is a subsidiary industry to most villages, the production is scattered a good deal. The total output from a village is small and since the price realized is small, it seems to me that any method of improving the marketing of this commodity is going to be more expensive than the commodity is worth.

Wool is marketed as loose wool and as spun hanks ready for weaving. In some cases weavers are shearers and the shepherd hands over his sheep for shearing and pays in kind either for the return of loose wool or blankets, woven from the wool.

It is my considered opinion that the improvement of this industry must start from the final market where classifying, grading, etc., should be done. The buyers attending the final markets should be taught how to purchase wool, and how it should be put up for sale at the final market. They, in their turn, would purchase wool according to what is wanted. The required knowledge would then filter down to the grower or shepherd. Once the grower or shepherd knew how, in what shape and at what time wool was required, he would soon fall in with new ideas.

The Departments interested in Sheep and Goat improvement will have to take up the problem of better shearing and at the same time show the shepherd how to classify his wool. This, coupled with a definite demand from purchasers, will soon put the industry on a better footing.

I have not touched the improvement of the industry from the better breeding or management point of view, as this is being discussed under a separate heading.

A good deal of improvement is possible from the village manufacturing side in blankets, rugs, and numdahs. A very poor quality of manufacturing article now reaches the market, which commands a small price, but if improved a larger income would result to this village industry.

APPENDIX XXII.

NOTE ON SUBJECT No. 24, BY MR. W. S. READ, ASSISTANT SUPERINTENDENT, FODDER, GOVERNMENT CATTLE FARM, HISSAR.

In connection with the newly aroused interest in the improvement of live-stock in India, the importance of "feeding" in relation to "breeding" should not be overlooked.

Breeding and feeding must always go hand in hand, as money spent on improving bulls and modern ideas in breeding, to a great extent, may be wasted, if feeding and foodstuffs are poor or insufficient in either quantity or quality.

This wave of enthusiasm for the improvement of live-stock has created a demand for pedigree animals for stud, which it will probably be impossible to satisfy for many years. There is, therefore, a danger that indifferent stock of unknown origin perhaps may be used to make good the deficiency, by the over-enthusiastic.

To those anxious to make progress in the improvement of live-stock, who are unable at present to procure first class animals for stud, some work on feeding problems might be suggested. Money, time and labour spent on improving feeds and feeding would not be wasted. Quite mediocre live-stock will quickly respond to better feeding, and a well nourished animal will produce better progeny than her less fortunate sister. When a pedigree bull is eventually obtained for an area where the cattle have been well fed and cared for, early and marked improvement in the progeny should be the result.

The foregoing remarks apply to the feeding of grain and concentrates as well as to fodder, but it is proposed to confine these notes to a summary of some of the work which can be done in respect to "fodder" and "fodder resources" only leaving grain and concentrates for separate discussion.

"Fodder" is the term generally used to describe the foods which are given to live-stock, for the sake of their bulk rather than for especially high feeding qualities. Fodder should not be regarded, however, as a mere "fill belly", as its low food value is really only relative when compared with the value of concentrates.

In other countries, live-stock get a fair proportion of their proteins from rich pasture grazing. In India, rich pasture lands are practically unknown, and good natural grazing is usually only seasonal. Proteins are a necessity for the growth and productivity of live-stock, and a lack of them is responsible for stunted growth and the slow development of progeny. A deficiency of proteins also renders live-stock (and particularly growing animals) more susceptible to disease, keeps them in poor condition, and ultimately leads to degeneracy. Village cattle in India usually spend the greater part of their days wandering about on bare fields, gleanings a meagre livelihood, which may be supplemented by some fodder of dubious quality when they come in at night. That this fodder should help to make good protein and other deficiencies in the grazing is, therefore, of considerable importance.

The following heads and sub-heads are an indication of some of the items in regard to fodder, that seem worthy of investigation :—

I. NATURAL FODDERS.

(a) *The Natural fodder resources of India.*

- i. Plains grazing,
 - ii. Forest and Hills grazing,
 - iii. Common grazing lands and village *shamlats*,
- are the chief of these.

(b) *The improvement of natural fodder resources.*

i. "Watbandi" (embankments) to conserve rainfall.

"Watbandi" is the system of using embankments (or *bands*) to conserve rainfall in the Plains, and to prevent erosion and the destruction of natural grazing in the Hills. Very few plains are truly level, and rainfall in India as a rule consists of violent showers; more water collects on the surface than can be absorbed, and there is therefore considerable "run-off" to the lower levels. Water collects in such places and grows vegetation of the coarser kind, and these *jholis* are often

the breeding places of live-stock diseases. Properly embanked land will trap rainfall where it occurs, and by checking excessive "run-off" produce good grass on the higher levels.

The Punjab Government proposes to spend about Rs. 78,000 on a "watbandi" scheme for the 35,000 acres comprising the *barani* area of the Hissar Farm. This will improve the grazing and increase the amount of grass available for hay-making. Money has also been spent in other parts of the Punjab on this work with good results.

The peasant in *barani* areas already knows the value of *watbandi*, and to some extent practises it on the land in which he grows crops. He should be encouraged to do the same on grazing areas.

Watbandi has also been used with considerable success in the foot-hills of the Punjab to prevent erosion and the consequent destruction of natural grazing.

ii. Phosphatic manuring to increase the quality and quantity of grazing.

There are often breaks in the monsoon, which, if of long duration, cause the grasses to wither early and to dry off. Even if good rains follow such a break, the recovery of the grass from these droughts is often very poor. This is a common occurrence in areas of low rainfall. Phosphatic manuring increases root development, and an application of superphosphates before the rains will assist in carrying the grass over these dry periods. Phosphatic manures are cheap, and are also cheap and easy to apply. The Imperial Council of Agricultural Research has sanctioned a scheme, designed to observe the effects of phosphatic manuring on grass in an area of low rainfall, at the Hissar Farm, from which data will be available in due course.

iii. Phosphatic manuring in hilly areas to prevent "run-off" and erosion.

Promising work in this connection has been carried out in the Pabbi Hills of the Punjab, as the results of which to date are probably available from the Forest Department.

iv. Cultivating operations.

Improved crops of grass can be obtained by breaking the surface of the soil prior to the monsoon. Deep work is not essential, and the *desi* plough, which is really a 1-tine cultivator, can be usefully employed for this operation. The broken surface traps grass seeds blown in the wind, and rapidly absorbs moisture from showers of rain.

v. Machinery and implements.

Where money is available, similar work can be done with ploughs or cultivators drawn by tractors. Quite small tractors, such as the "Fordson" and the "Marshall", have been used with encouraging results at Hissar.

(c) Utilization of natural fodder resources.

i. Systemised grazing.

Uncontrolled grazing is one of the chief causes of poor crops of grass on common grazing lands and village *shamlats*. Such areas should be divided up with fences or embankments so that rotational grazing and rotational cultivation may be carried out. Banks for the conservation of moisture should also be made on these areas.

The collection of manure from these lands for use as fuel should be prohibited, otherwise nothing is put back into the land by the animals in return for what they take out.

The leasing out of common grazing lands and *shamlats* to contractors is to be deprecated. This system readily lends itself to abuse, as passes may be issued to graziers of sheep and cattle from distant places, to the detriment of the local live-stock for whom such grazing lands are really intended. Contractors for grazing rights also do nothing to improve the land or the grazing.

ii. Conservation of seasonal surpluses of grass.

1. Hay-making operations.

Hay is the air-dried produce of grass and fodder crops. There are numerous grasses in India which make good hay. In a good monsoon season there is usually a quantity of grass surplus to grazing requirements, but it is doubtful if this is generally utilised to the best advantage. A lot is wasted by uncontrolled grazing and trampling when large areas could perhaps be reserved for collection and preservation as hay.

Grass is at its highest nutritive value just before the flowering stage is reached. It is, however, uneconomic to cut grass early to secure high quality at the expense of quantity. It is also a mistake to let a crop ripen too far and thus sacrifice good quality.

Nutritive value in grass and fodder crops decreases steadily with growth due to the increase in the amount and hardness of fibre. Therefore, the best stage at which to harvest a crop is when the best results of both quality and quantity may be obtained. Weather conditions must also be taken into account.

The villager should be encouraged to preserve more of the surplus monsoon growths to cut as hay. Where anything like large scale operations are practised at present, other than on Government Institutions, they are often the work of contractors who cut and bale the grass for despatch to large towns. This practice requires watching, as if carried too far, it may be to the detriment of the food supply of the cattle adjacent to the areas where such operations take place.

2. Silage-making operations.

Natural grasses and other monsoon vegetation can also be preserved as silage. This is a simple operation, and unlike hay-making, can be carried on during wet weather. As grass is usually cut much earlier for silage than for hay, the grazing on the harvested area is usually better than after cutting for hay. It is much better to make silage than to preserve bad hay, but it is generally considered more profitable to make hay if it can be stored in reasonably sound condition. Silage, however, has distinct advantages where dairy herds are kept.

(d) Other natural forage.

1. Fodder bearing trees and shrubs.

There are a number of trees, shrubs and bushes found in India which bear crops of fodder in the form of leaves, pods or berries. These are already utilised to some extent both by grazing and by collection. The methods employed by the peasants of stripping the foliage from the trees, however, often leaves much to be desired.

A tabulated list of all fodder bearing trees, bushes and shrubs found in various parts of the country would be of great value.

ii. Economic utilisation of fodder bearing trees, etc.

Certain shrubs and bushes grow wild during the rains. These are cut down after the berries appear, and after being collected in heaps to dry, are beaten with sticks until the leaves and berries drop off. This produce is stored as fodder whilst the thorny residue is used for fencing fields. These edible bushes and shrubs are entirely a natural growth, propagated by the winds and from seeds passed through the bodies of the birds and beasts which feed on them. So far as is known, no attempt has so far been made to increase this source of fodder by the collection and sowing of seeds. An ideal place for such an experiment would appear to be in the borrow pits dug when making embankments in *vatbandi* schemes.

The peasant should be taught how to prune and lop trees, so as to obtain a maximum of fodder with a minimum of damage to the trees. At Hissar, during the double famine of 1920-21, when fodder reserves were exhausted and the standing crop had been fed off, many hundreds of animals were kept alive by a daily issue of fresh foliage from trees, mostly *shisham*. A given number of trees were pruned each day, and in the evenings the cattle were driven up to them to eat the leaves. Practically every tree on the Farm was treated in this manner, and although the pruning and lopping was drastic, the work was done so well that all of the trees survived.

iii. Re-afforestation with fodder bearing trees.

More work in this direction would do much to increase the amount of natural fodder available. In Hissar, where the average annual rainfall is only 14", the Mesquite tree, introduced some years ago, has been successfully grown from seed under *barani* conditions. This tree bears a heavy crop of edible leaves and pods.

iv. Preservation of edible leaves.

When there is a glut of grass and good grazing, fodder grown on trees is usually neglected. It should be possible to preserve edible leaves and pods as hay or silage in such seasons.

During the Great War the Germans used the foliage of trees as dry fodder when hay became scarce. Bales of compressed foliage abandoned by them during the closing stages of the War were used by the Allies and found to be excellent fodder.

Experiments in ensiling *shisham* foliage were made at Hissar some years ago, and good silage was made. The lack of some quick, cheap method of removing the leaves and seeds from the twigs before ensiling, was the major difficulty.

II. CULTIVATED FODDER CROPS.

(a) Cultivated fodder and semi-fodder crops.

These may be divided into two groups—

- i. Irrigated.
- ii. *Barani*.

The farmer on irrigated land usually has the advantage of being able to grow a great variety of crops and can often take more than one cutting from a crop.

(b) The improvement of fodder crops.

Some of the methods by which fodder production may be improved, are as follows :—

- i. Fodder Research Institutes in all Provinces and at selected Government Farms.

This work should be quite distinct from Animal Nutritional Research.

- ii. Fodder experimental plots, both irrigated and *barani*, in all Districts.

There is much scope for work in the improvement of *barani* fodders, especially in regard to drought-resistant varieties.

- iii. Land reclamation with leguminous fodder crops.
- iv. Improved seed.
- v. Improved and more prolific varieties.
- vi. Improvement of local varieties.
- vii. More intensive fodder production on irrigated land.

The farmer is inclined to grow as little fodder as possible to get more land under paying crops. He should therefore be taught to get the maximum yields of fodders per acre by intensive methods.

- viii. Development and improvement of irrigated pasture and paddocks.

This method of grazing is found almost only at Government Institutions, and yet it is a cheap way of feeding live-stock. Phosphatic manures are also useful to increase the grass on such pastures and paddocks.

(c) Utilisation of cultivated fodder crops.

There is much scope for improvement under this head, such as—

- i. Grazing green crops economically.
- ii. Harvesting green crops for feed.

iii Conservation of green and dry fodders, by—

- 1 Storage of bhusa.
2. Hay-making and stacking operations
3. Silage-making operations.

The latter deserves more popularity in irrigated areas, where crops such as the sorghums after being cut green for ensilage, will grow up a second time for hay.

Juar grown for hay should be cut green and cured in the air to make a good ration. The peasant invariably allows the crop to seed, and after robbing it of the same preserves the hard dry stalks to feed to live-stock. This is a much poorer ration.

- iv. Conservation of the natural grasses found on the watercourses and lands on irrigated land.
- v. Baling and transport of fodder.

III. FODDER IN RELATION TO CATTLE BREEDING AREAS.

Fodder problems are usually more acute in the good cattle breeding areas, which being more often than not areas of low rainfall, are subject to frequent famine or scarcity. There is considerable scope for work in such localities in many different ways, such as—

- i The encouragement of economic grazing, and utilisation of natural fodders.
- ii. Conservation of natural fodders in times of plenty.
- iii. The cultivation of a larger area of real fodder crops, both irrigated and *barani*.
- iv. Provision of Fodder Reserves to carry over famine and scarcity periods by the preservation of grass and cultivated fodder crops in bumper years.
- v. Co-operative stacks and silo-pits in villages.

Silage in *barani* areas should usually be made from monsoon grasses. Grass can be cut and ensiled during the wet weather when the peasant cannot plough, as when as he is able to plough and sow he has no time for hay-making. From his cultivated *barani* crop, however, hay-making is preferable, as there is not much point in making silage from crops which will only give one cutting.

- vi. Investigations to establish whether in view of the improved, and still rapidly improving communications in India, the cultivation of food grains and commercial crops in recognized cattle breeding areas could not be reduced.

When the village was an isolated unit, it was necessary that the crops grown should make the village as self-supporting as possible, and even in cattle breeding areas, food grains, cotton, etc., had to be grown for domestic consumption. For this reason the cattle were often short of fodder. The development of road and rail transport has radically altered conditions in certain areas and hundreds of villages are now no longer isolated or dependent upon their own products.

It is an interesting question whether it would not now be better for the cattle breeder to concentrate more on the production of larger crops of grass and fodders, and from the better prices/his improved animal products should command, purchase his food grains and domestic requirements from non-cattle breeding areas.

Should the reply to this question be in the affirmative, arrangements for the better marketing of animal husbandry products from such areas become essential.

- vii. Transport of fodder to famine stricken areas and fodder concessions.
- viii. Investigations with regard to the possibility of providing wells, in *barani* cattle breeding areas, subject to a condition that the use of the same is restricted to watering cattle and the cultivation of fodder crops only.

APPENDIX XXIII.

NOTE ON SUBJECT No. 25, BY DR. P. E. LANDER, AGRICULTURAL CHEMIST TO GOVERNMENT, PUNJAB, LYALLPUR.

A number of workers in different countries has carried out experiments in order to ascertain the value of molasses as an additional or supplementary ration for various classes of farm animals. The results obtained are somewhat indefinite and various figures have been given as to extent to which molasses can replace concentrates and roughages. Some work on this has been done in India, but considerably more is required before we can lay down anything in the nature of definite figures.

The attached table gives the comparative analytical figures for gram bhusa and molasses and it will be seen that the value of molasses as a feeding stuff lies almost entirely in its carbohydrate content and to some degree also in its phosphorous content. It is a well known fact in dietetics that when a meal is taken consisting of combined protein and carbohydrates a high percentage or excess of carbohydrates has a tendency to interfere with the optimum utilisation of the protein. In order to ascertain whether molasses added to a ration would prove beneficial or detrimental in this respect some digestibility trials were carried out at Lyallpur on groups of heifers and bullocks to whose rations were respectively added 4 and 6 lbs. of molasses per day. In brief the digestibility coefficients of the protein of gram bhusa when fed alone to 6 animals ranged from 40 per cent. to 56 per cent. but corresponding figures for the same ration when 4 and 6 lbs. of molasses per head were added per day ranged from 14 per cent. to 26 per cent. only. This indicates that the influence of the added molasses is to depress the availability of the protein in the ration, so that whatever the value of the molasses in terms of digestible starch equivalents may be, a wastage of the more valuable protein is being incurred. The protein content of the molasses being extremely small its calculated digestibility in these trials was always negative.

Some feeding trials with added molasses have also been carried out at the Lyallpur Agricultural Station by Sardar Labh Singh and Sodi Gbambir Singh (9) on bullocks, from which the investigators concluded from purely external observation that 2 lbs. of molasses were able to replace 2 lbs. of maize grain and in other cases 4 lbs. of molasses were required to effect the same saving. They also concluded that as the quantity of molasses fed per diem is increased beyond 2 lbs. the efficiency of the additional molasses as a feeding stuff decreases.

The data obtained by these observers is of a somewhat empirical nature, and it would be advisable to carry out experiments designed to ascertain whether the working bullocks with added molasses obtained as many or more digestible starch equivalents in the daily ration as those without the added molasses.

The general consensus of opinion appears to be that from one to two pounds of molasses can reasonably be fed to farm animals per diem, but more systematic work is required with working bullocks, heifers and dairy cows before we can lay down any very definite stipulations as to the exact place which molasses should occupy in India as a supplement to the ordinary ration. It undoubtedly has a considerable value as a supplement, or part substitute in maintenance rations, and in this connection some statistics for the Punjab of the total number of livestock in round figures, and the available molasses is instructive.

From the 1935 Cattle Census there are about 13 million head of livestock excluding goats, sheep and horses. The total produce of Gur per annum averages 805 million pounds; if 50 per cent. of this Gur is converted into white sugar the remaining 50 per cent. would produce roughly 258 million pounds of molasses. If, therefore, only 1 lb. of molasses were fed per day to the livestock of the Punjab the available supply of molasses would last only 20 days.

Some references to the results of other workers who have applied molasses in rations for different types of animals is appended to this note.

Some of the conclusions arrived at are at variance with one another and it is advisable that the problem should be worked out more fully in India for various types of animals.

It is well known that the average Zamindar is extremely reluctant to spend money on additional feeding stuffs other than his land will produce, and if we are going to advise him to use molasses as such, or feeding stuffs manufactured with added molasses, a very clear case must be made out to induce the Zamindar to use a new commodity when his financial resources are extremely small.

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TABLE NO. 1.

Chemical composition as percentage on material as such

	Mols- ture.	Dry matter.	Ash.	Fat	Fibre.	Protein.	N. F. E.	P ₂ O ₅	CaO.
Gram Bhu-a . .	9.40	90.60	9.54	0.58	40.36	4.94	35.18	0.1058	1.431
Molasses . .	24.64	75.36	4.68	...	...	0.69	70.00	0.1007	...

APPENDIX XXIV.

NOTE ON SUBJECT No. 26, BY DR. K. C. SEN, D.Sc., OFFICER-IN-CHARGE, ANIMAL NUTRITION SECTION, IZATNAGAR.

The object of this note is to invite suggestions by which the recently established Animal Nutrition Institute at Izatnagar can fully co-operate with other nutritional laboratories in the Provinces in the matter of both laboratory and field research in animal nutrition including certain aspects of deficiency diseases. It may be stated in the beginning that the Central Animal Nutrition Institute forms a section of the Imperial Veterinary Research Institute and maintains a close connection with its other sections, notably with the sections of Serology and Pathology, and is thus in an exceptional position to offer help to field workers in the Provinces. When fully organised, the Institute will consist, apart from the analytical laboratories, nutrition stalls, small animal house and post-mortem room of well equipped laboratories for the study of animal physiology, pathology and avitaminosis problems among farm stock. Besides these, the Institute will have a very good Library and being in close association with the Muktesar Library which is acknowledged to be one of the best on animal husbandry matters, will provide necessary help and facilities in obtaining scientific literature on nutritional subjects. The functions of this Institute, as set forth in a communication from the Government of India, may be seen in the appendix, but it may be stated briefly that as the Central Institute is likely to take up investigations mainly of a basic nature, it is improbable that there will be any duplication at the Central Institute of the work which will be carried out in the Provincial laboratories.

In submitting some tentative proposals for discussion, it is assumed that workers in the Provinces would like to avail themselves of the help and services which can be rendered to them by the Central Institute, but it is not the intention of the writer to suggest that the Nutrition Institute would advise the Provincial workers as to the type of work they should carry on, the methods which may be used or the plans which they intend to follow, unless advice on these points is expressly asked for. It is necessary to make it clear at the outset that the relation between the Central Institute and the Provincial laboratories will have to be built up on the basis of mutual co-operation and on a footing of perfect equality, and that no question of inferiority in status arises because some information or advice is sought for from the Central Institute. The workers of the Central Institute will also not hesitate to take advantage of the suggestions which may be made by the Provincial laboratories and seek co-operation in conducting field experiments in different parts of the country.

The subject-matter of this note may be divided into two broad groups, namely, (1) the question of co-ordination of work and (2) the dissemination of information. The problem of co-ordinating the work in different provinces is not an easy one to solve, but the following points may be considered in this connection :—

(1) Avoiding duplication of work of similar type.

(2) Standardising the methods of assay and analysis at the Central Institute.

(3) Collating the results obtained in different laboratories at the Central Institute. The work of co-ordination would be facilitated if

(1) there is a mutual exchange of the research programme of different laboratories, to be supplied in advance,

(2) interim reports on the progress of works and tentative conclusions are circulated, and

(3) arrangements are made for periodical discussions on current nutritional problems under the auspices of the Central Nutrition Institute.

The above points may be slightly amplified by stating that it would be an advantage to all workers if the programme of work in different provincial laboratories is known to them. If a copy of the intended programme is forwarded to the Central

Institute, the latter will immediately communicate the information to all the different laboratories concerned so that duplication of certain types of work may be avoided. This view is expressed in general terms because it is realised that duplication, to some extent, is inevitable in this country. For example, although digestibility work is of the same type, every provincial laboratory will have to carry out digestibility trials with the common feeding materials available in the particular province. Attention may therefore be drawn to the possibility of co-operation between two laboratories dealing with almost identical subjects, such as the value of rice straw or wheat straw, etc., as the main roughage in the rice growing or wheat growing tracts and to the need for centralising these works in particular places.

There are a number of investigations which are being carried out in different parts of the country, but the results are usually available after a long time. When a long term experiment is undertaken by a particular laboratory in which workers from other parts of the country are also interested, it would be useful to everyone if progress reports containing tentative results could be furnished to them. The Central Nutrition Institute would like to have these conclusions from provincial workers and would be able to pass on the information, together with those obtained in its own laboratories, to interested workers on the distinct understanding that the information is confidential and that none of these conclusions should be published without the previous permission of the laboratory concerned.

The question of assessing the value of the results obtained in different laboratories in allied problems deserve some attention, as it is often difficult to compare data from two laboratories unless more or less similar methods of analysis are used. If desired, the Central Nutrition Institute would be prepared to take up the work of collating the results obtained in the Provinces and then forward the conclusions to different laboratories for information and criticism.

The work of co-ordination would also be greatly facilitated if arrangements could be made for nutritional workers to meet occasionally, as for example at the time of the Animal Husbandry Research Workers Conference, and hold discussions on current problems. The Central Institute would be able to arrange a suitable agenda in consultation with the Provincial laboratories.

From what has been stated above, it will be apparent that the Central Institute is prepared to act as a sort of clearing house for information on current research work in the country. In addition to this, it should be possible for it to collaborate with Provincial works in specified types of field work and to take up basic investigations at their request.

In order to utilise the services of the Central Institute as the Central Bureau for dissemination of information, the following points may be considered :—

- (1) Apart from acting as a sort of clearing house as mentioned previously, the Central Institute should be in a position to supply all interested workers with abstracts of current literature or translations of articles published in German or French periodicals which may be of direct value for the prosecution of certain researches at the request of these workers.
- (2) Data of basic or practical importance to Indian workers should be made available to Provincial laboratories.
- (3) It should be possible and indeed it would be necessary for the Central Institute to issue periodical popular bulletins for the benefit of Veterinary and Agricultural field workers including "publicity" officers indicating the position of feeding problems in connection with malnutrition in different parts of the country, the methods which are being adopted to prevent malnutrition and the practical results available. A cyclostyle bulletin, issued as required, will probably meet the requirements for the time being.

APPENDIX.

Establishment of an Animal Nutrition Institute at Izatnagar.

* * * The main functions of the Institute will be the study of nutrition in relation to the maintenance of health, normal growth and productive capacity of animals in India, and included in its main lines of work will be the following :—

1. Analysis of the important foodstuffs of India.
2. Analysis of the pastures of typical grazing areas.
3. Digestibility and utilisation experiments on foodstuffs of all-India importance.
4. The physiological significance of the Inter-relation of foodstuffs.
5. Correlation of the nutrition work done at the Central Institute and at Provincial centres.
6. Diet in relation to growth.
7. Diet in relation to milk production.
8. Diet in relation to work.
9. Diet in relation to wool production.
10. Diet in relation to the production of hides and skins.
11. Diet in relation to breeding problems.
12. Mineral requirements.
13. Vitamin requirements.
14. Collaboration with Agriculture on factors affecting the composition of foodstuffs.
15. Collaboration with Muktesar regarding the influence of nutrition on susceptibility to disease.
16. Basal metabolism.

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APPENDIX XXV.

NOTE ON SUBJECT No. 27, BY DR. K. C. SEN, D.Sc., AND V. R. RAJAGOPALAN, G.M.V.C.,
IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.

The occurrence of abortion in Indian horse-breeding studs is so frequent as to render it a problem of great importance from the practical standpoint. A vast country, like India requires a large number of horses, ponies and mules for purposes of transport, remounts and sport. There is thus an urgent need for removing the greatest obstacle in the way of successful breeding of equines, namely abortion, so that the large amount of money now being spent in importing these animals from foreign countries may be saved.

Although abortion in a strict sense is the expulsion of the foetus between the time of fecundation and the time of attainment of full term, it should be recognised that the same causes which lead to abortion, may, in a severer form, prevent fecundation thus leading to sterility, or, on the other hand, in a milder form, lead to the birth of a weak or dead foal at full term.

Abortions are known to occur among equines in several studs in India due to infection with the common causal organism of equine abortion, namely *S. abortus equi*. The incidence and extent of this condition is easily determined by periodic agglutination test and by the cultural examination of aborted foetuses and the genital organs of the mare. This condition has been under intensive study at Muktesar for several years. By the introduction of hygienic measures, by segregation and by a system of vaccination Mr. J. R. Hadow, Serologist of this Institute, has succeeded in controlling the disease to a considerable extent in some stud farms. Nevertheless a good percentage of abortions still occur in these herds. *Esch. coli* and certain non-mammite fermenting *Salmonellas* have been occasionally recoverable, but the fact that nothing significant could be recovered from the vast majority of such cases had led one to suspect that a nutritional factor might be involved in these cases of abortions.

Recently evidence definitely incriminating nutritional factors with incidence of equine abortion has been forthcoming. This note is therefore prepared to focus attention on this neglected aspect of equine abortion.

Unfortunately a reference to the literature shows nothing helpful with regard to nutrition in equines, not to speak of nutrition as affecting reproduction in them. We have to depend largely therefore, for our ideas on work done on other farm animals on this subject. Mineral metabolism is a physiological problem, and data collected from one species of mammal is fortunately often applicable to other species of mammals.

'Deficiency' in minerals may practically determine susceptibility to infections. There is some evidence that deficiency in minerals may be a predisposing factor to infection of the genital tract of the cow with *Br. abortus* (Meigs, 1926; Smith, 1931) or other organisms (Williams, 1923, 1932; Nielson, 1926) which interfere with reproduction. Evidence has been obtained at Muktesar (6 cases) that certain non-pathogenic micro-organisms like *Esch. coli* might, under certain circumstances assume pathogenicity and induce abortions in cows. Such strains are usually highly haemolytic, are agglutinable in some instances at high titre by the cow's serum and are pathogenic to the rabbit and the guinea-pig, killing them, at small dosages, with the production of characteristic inflammation of the genito-urinary system. However, the introduction of these strains into the vagina of normally kept cows did not lead to abortion. This suggests that, in nature, these organisms assume virulence only under certain conditions. We have obtained evidence at Muktesar that this predisposing factor may be one of mineral deficiency. A cow which was kept experimentally on a phosphorus deficient diet gave birth to a calf which died at birth, and from the calf and from the genital tract of the cow, *Esch. coli* with similar properties was isolated.

It is possible that mineral deficiency, apart from promoting susceptibility to infection, may also directly impair reproduction by starving the foetus or the new born animal of essential minerals or by preventing ovulation, or by inducing metabolic and other changes through disturbances of the endocrine system. Thus it has been claimed that the lowered fertility associated with phosphorus deficiency is due to in-

frequency of ovulation (Eckles and others, 1926). Hammond considers that the nutrition of the ova previous to fertilisation may affect their vitality. There is also evidence that defective mineral nutrition may lead to embryonic degeneration (Orr, 1930).

Calcium is one of the minerals which have been found to be essential for proper reproduction. Deficiency in this mineral predisposes cows to infection with *Br. abortus* (Meigs, 1926; Smythe, 1931). Protracted deficiency in the ration of breeding cows leads to a very considerable increase in the number of pigs born dead (Davidson, 1930). Kossman, Meigs, Fraser, Hart and others have observed that animals fed on a calcium deficient diet either aborted or gave birth to weakly young that died soon after birth.

Orr (1930) found that the increase in embryonic degeneration in pigs fed with a lime deficient diet was most striking. Basket reports very poor breeding results in a pig herd which immediately disappeared on the addition of a mineral mixture rich in lime. Kennedy (1926) observed loss of tone of the uterus and subsequent sterility.

Phosphorus is another mineral that is also essential for proper reproduction. It has been shown by Theiler and his associates in South Africa, by Henri in Australia and by Eckles, Becker and Palmer and Hart in U. S. A. that deficiency of phosphorus leads to abortion and sterility. In an observation on 200 native scrub cows, half of which received a supplement of bone-meal, Theiler, Green and Du Toit (1927) found that 80 per cent. of the bone meal fed lot calved normally while only 51 per cent. of the controls calved. Du Toit and Bisschop (1929) report an experiment continued for 3 years with 109 bone meal fed cows and 20 controls in which the bone meal fed group produced 87.3 per cent. of the possible number of calves, while the control group produced only 56.5 per cent.

It may be stated here that in many of the above studies regarding the effect of lime and phosphorus metabolism, the possibility of simultaneous vitamin A deficiency influencing the results was not considered.

Iodine is also essential for proper reproduction, for, as pointed out by Orr and Leitch (1929) breeding difficulties in domestic animals tend to appear in all areas of endemic goitre throughout the world. It appears to exert a stimulating effect on follicular development. Several workers in Europe and elsewhere (Stiner, 1924; Scharer, 1933; Orr and Leitch, 1929; Miller-Lentharz and associates; Corrie; and others) have reported beneficial results on fertility in dairy cows and pigs following the feeding of iodine or the grazing of animals on pasture manured with iodine. Ennis Smith (1917) showed that abortion and mortality of the new born in pigs may be prevented by administration of iodine to the cows. Thompson's (1934) experimental results indicate a possible role of iodine in the prevention of contagious abortion.

There is thus considerable evidence to show that deficiency of mineral such as calcium, phosphorus and iodine may lead to abortion and sterility in many species of farm animals, such as cows and ewes. It is therefore quite probable that faulty mineral metabolism may give rise to similar physiological disturbances in equines as well. Thus, Wall (1935) describes an outbreak of abortion among mares in which deficiency of calcium was found to be the main cause. The possibility of infection with micro-organisms and of intoxication with food stuff was eliminated by proper examination, but a deficiency of calcium in the diet and hypocalcaemia in some of the mares and foetuses were demonstrated.

A similar case came to the notice of the Muktesar Institute recently, when it was called upon to investigate an outbreak of equine abortion. Infection and toxic factors as possible causes were eliminated after thorough examination. It was noticed that the incidence of abortion in the stud was from 4 to 7 per year before 1929. The authorities began feeding their mares with a mineral mixture from 1929 with a view to improve the bone of their young stock. Abortions disappeared from the stud simultaneously. In 1934, they stopped feeding the mineral supplement. There were two abortions late in 1935, and thirteen abortions up to May during 1936. The calcium content of the blood serum of the aborting mares ranged in most cases between 7.7 and 9 m. gm. per 100 c. c. as compared with an average of 12.3 m. gm. per 100 c. c. in normal ponies at Muktesar. The mineral supplement was re-introduced along with a supplement of freshly germinated wheat. The incidence of abortion ceased.

Similar figures for calcium, suggesting a calcium deficiency, have been obtained from aborting mares in certain other farms as well.

In a private communication Pfaff communicates an interesting experience. In a certain stud farm in Burma odd cases of abortions have been occurring for some years past. Writing on 19th August 1932, he says: "in 1932 up to 28th of May no live foals were born. Abortions occurred on the 28th March, 30th April, 1st May and 25th May. On the 1st May cod-liver-oil and bone meal were started. Between 28th May and 10th August no abortions have taken place, but 15 full term live foals have been born". Here is an indication that deficiency in minerals was perhaps responsible for these cases of abortion.

These results suggest that, as in other farm animals, minerals may play an important role in reproduction in equines. The problem deserves further investigation under controlled conditions.

In conclusion it may be emphasised that the role of minerals in equine abortion has been discussed in this note mostly from the standpoint of the results obtained in the study of the nutrition of cattle, sheep and pigs. It is unfortunate that very little work has been done on equine nutrition, and in particular on mineral metabolism in relation to abortion. The study of equine nutrition is however of great importance to this country and it is desirable that systematic research on the dietetic requirements of horses and mules should be carried out so as to improve the condition of our breeding stock and young animals.

APPENDIX XXVI.

NOTE ON SUBJECT No. 28, by P. V. RAMIAH, M.A., B.Sc. (EDIN.), AGRICULTURAL RESEARCH INSTITUTE, COIMBATORE.

The problem of the mineral nutrition of Dairy stock, has long been recognised as of great importance, and a large volume of work on the subject has been carried out in Great Britain, America, and South Africa. Despite this fact, no definite standards of mineral requirements have yet been set up, to guide the farmers in making up rations to supply the animals the proper quantity of minerals, but some data are available as to the qualitative requirements.

In India, the position is obscure, in-so far as no data are yet available as to the mineral requirements of Dairy stock, or the mineral content of concentrates and fodder. While there is no evidence of widespread incidence of actual diseases due to mineral deficiency, there seems to be ample evidence of a shortage of minerals resulting in lowered production and sub-optimal growth among dairy stock in South India, particularly in certain areas like the Malabar district and in the rice growing areas. A shortage of mineral nutrients may be more harmful in the long run, resulting in general lowering of the vitality and productive capacity of animals.

Preliminary experiments conducted at Patna by Chauduri (Ind. Jour. Vet. Sci. & An. Husbandry, 1933, 3, 174), and at Coimbatore have shown that the feeding of a mineral mixture to calves had a beneficial effect on growth, and now in the Cattle Breeding Station, at Hosur and the Coimbatore Dairy, a mineral mixture consisting of shell lime and bone-meal (1 : 1) is fed as a routine with the daily ration.

Surveys of pastures in the Central Provinces and Madras have shown that the common grasses were deficient in CaO and P_2O_5 , the grasses of Malabar being markedly so, for P_2O_5 .

With the meagre data available and the indication of shortage of minerals if not actual deficiency it is advisable that work be taken up in the provinces, to investigate this question.

A beginning has been made at Coimbatore with the starting of a scheme financed by the Imperial Council of Agricultural Research, and work done so far has shown that were it not for the inclusion of a mineral mixture, the liberal ration fed would fail to supply sufficient mineral matter i.e., CaO and P_2O_5 to young stock and cows. The position of animals not belonging to Government Farms, would thus be probably much worse.

It is suggested that the Central Institute at Izatnagar undertake the starting of work on a standard plan in other provinces and to collate and co-ordinate results.

APPENDIX XXVII.

NOTE ON SUBJECT NO. 29, BY ZAL R. KOTHAVALLA, B.AG. (BOM.), B.SC. AGRI. (EDIN.),
N.D.D. (SCOT.), IMPERIAL DAIRY EXPERT.

Present position.

In considering the question whether the time is ripe for the formation of breed and milk recording Societies in India as an aid to developing high milk yielding strains of the more important Indian breeds of cattle, one has only to survey the difficulties experienced at present in the purchase of milch animals. Barring a few Government farms and still fewer privately owned farms, recording of the history and performance of a dairy cow is unknown. With the result that when one has to purchase a milch animal from the market he has to take his chance, and more often than not the result is very disappointing. The buyer has to judge the qualities of the animal from its appearance if it is not in milk at the time. If the cow is in milk, she is milked once in the presence of the buyer, but the chances are that the milk is not drawn from the cow for one or two previous milkings to inflate her udder and increase the yield at the time of the "test milking". The buyer is, therefore, invariably deceived. In some of the areas where there is an established trade in milch cattle, such as round about Karachi, Hariana and Rohtak district and some parts of Gujerat, the practice followed to a certain extent is to test the milk of an animal for three consecutive milkings. While this is an improvement over the test of one milking, which is the universal practice, the purchase of the unknown animal even after the "three milking test" is still a gamble. The net result of all this is that the public are reluctant to invest their capital in an enterprise the very foundation of which (the dairy cow) is so uncertain. On the breeders side, with the uncertainty about the market and the lack of appreciation of a better quality animal there does not exist an incentive for him to breed improved stock. Consequently, the dairy industry of the country to-day is labouring under a serious handicap. On the side of breeding and fixing of type, the breeder is equally callous. The idea of the characteristics of some of the Indian breeds is very vague and each breeder breeds his stock according to his own fancy. The result is that there is such a lot of variation in the conformation and appearance of the animals of the same breed that the buyer is at a loss to know whether he is getting the right type of material or not for starting his business. The decision recently taken, therefore, of establishing "Herd Books" for some of the important Indian breeds of cattle is in the right direction and it has not been taken a moment too early. In parts of the world where cattle-breeding and dairying are very much advanced, no sooner were the "Herd Books" established for the various breeds, it was realised that improvement of cattle based on "morphological selection", that is on the choice of points relating to outside conformation corresponding to what is known as a good "dairy type", was not always a reliable method of developing a "dairy strain". There is no doubt that there is correlation between conformation and good milking, but it is also certain that this correlation is not absolute and at times may not be present at all. Morphological selection was, therefore, combined with functional selection and this introduced the methodical testing of the quantity as well as the quality of milk of each cow. "Milk recording" therefore became a necessary corollary to the establishment of "Herd Books" and as breeding for appearance and performance was to go hand in hand, it was more appropriately termed "Contesting" instead of "Milk Recording". In countries where therefore "Herd Books" have been established, before an animal is accepted for entry to the "Herd Book" it has to come up to a certain standard requirements commonly known as the "minimum entrance requirements" to the Herd Book. These requirements are based more on utility than mere fancy points. These would be (a) the description of the animal with the evidence that it is breeding true and is of the "recognised type". For this reason no animal is accepted till its history and performance records can be verified for three generations; (b) A minimum level of milk production within a specified period of lactation, which is generally 300 days; (c) Minimum total quantity of fat production, usually not giving below a certain percentage during the periodic test; and (d) The animal must belong to a herd which is enlisted under a "Cow Testing Association" and over which there is Government control or control of a recognised authority. The latter condition makes it imperative that the effort at developing the breed for a high milk yielding strain should be an organised one, as individual efforts in a matter like this have generally proved ineffective and very costly. Besides all the benefits which could be commanded through the resources of

an association could not be had through individual efforts. With an association, the exercising of control and supervision of the authority concerned is also facilitated. If, therefore, this country has to make any headway in the development of its dairy cattle it will not only have to establish Herd Books for the different breeds, but it will also have to provide material for the Herd Books, by regional testing of the animals to conform to certain standards. In other words, if the proposed Herd Books, for some of the important breeds of Indian cattle are to serve any useful purpose they must be associated with the establishment of "Breed and Milk Recording Societies" or what might be rightly called "Cow Testing Associations". With the present disorganised condition of the dairy industry of the country, the backward state of the breeders and the lack of proper organisation for the systematic control of such activities and the vastness of the country, the work to begin with will no doubt be uphill, but it was only from small beginnings that most of the countries of the World obtained their premier position in dairying.

Development in Denmark.

Denmark in that respect provides an inspiration and an example. The first Cow Testing Association in the world was started in Vojens, Denmark on 1st May, 1895 and that too on the initiative of a lady with 12 members. About 10 years later, when the first C. T. A. was started in U. S. A. Denmark had about 300 associations with about 7,000 members and 112,000 cows. Ten years later, in 1915 there were 610 associations; in 1925 over 1,000 and in 1934 there were 1,579 C. T. As. with 48,948 herds and 678,402 cows. The number of membership for each association varied from 15 to over 30, depending on the size of the herds—many herds being only of a few cows. There are areas in Denmark where as high as 70 per cent. of the cows are tested. During 1933-34 the average expense was slightly less than 50 cents (i.e., annas 4 ps. 11) per cow per year. But it must be remembered that Denmark is a small country and for an area of 19,000 square miles, there were close on 1,600 C. T. As. in 1934. In Denmark the requirements for entry in the "Herd Book" are based on the C. T. A. records. In order to encourage this movement and develop it on right lines Government give an annual subsidy of 75-100 Kroner (about Rs. 62 as. 8) to an Association having not less than 10 members and 200 cows. In return the association has to supply a summary of each cow's production to the controlling authority—the Dairy Chief, who then publishes the average yearly record for each herd in different associations. Besides financial help, technical advice and guidance is given through a Central Dairy Organisation. In addition to the other expert technical staff in the Dairy Organisation, Denmark employs 50 Consultants who devote their entire time to dairy cattle work. Besides looking after the work in the associations, they assist the Bull Societies and help to prepare information about pedigree and yields of animals to be exhibited at cattle shows. They also have charge of the registering of dairy animals in the Herd Books and the progeny testing of bulls of dairy herds. The idea, of the extent to which these combined efforts of Government and the C. T. As. benefited the dairy industry of the country can be gathered from the fact that in 1881 the average production of the Danish cow was 110 lbs. fat a year and the total export of butter about 26 mil. pounds. In 1934 the average fat production of the Danish cow rose to 298 lbs. and the total export figure for butter to 330 mil. pounds.

Organisation recommended.

This instance of just one country provides a proof that if India has to make any progress in the development of the dairy industry, she will have to adopt similar measures and there cannot be a more opportune moment for it than the present one when the Herd Books are to be started. The breeds to be selected for developing the "dairy strains" should be those which are selected for the Herd Books, which should include buffaloes also, bearing in mind the fact that the C. T. As. will be one of the foundations on which the dairy industry of the country is to be built up. It may be preferable to make a beginning in the breed tracts. This means that a suitable organisation for its working and control is indispensable. This can be visualised in the form of a "pyramid" the Cow Testing Associations, the Breeding or Bull associations, etc., forming the base. The Local Associations would then combine into District Associations, these in turn into Provincial Associations which then unite into a Central Body which might be called "The All-India Cow Testing Association", representing the dairy interest of the country, as a whole to

be controlled by the Bureau of Dairy Industry working under the guidance of a Dairy Specialist. For, it is an undisputed fact that wherever progress has been made in dairying in countries like Denmark, U. S. A., New Zealand, etc., it has always been under the basic control and guidance of a dairyman. In an organisation such as is suggested above the detailed management will rest with the Local and Provincial Associations. Whereas the influence from the Centre will mostly be in the direction of providing general guidance, co-ordination of the efforts of the various Associations and Provinces and maintenance of a uniform system of working as far as possible. This will take the form of :—

- (1) Giving a subsidy to local associations under certain conditions with a view to encourage the movement.
- (2) Providing model laws and bye-laws and lending help of expert staff for organising new centres.
- (3) Periodic test of the herds to verify the records maintained by local and provincial associations before accepting them for publication and entry into "Herd Books".
- (4) Collecting and publishing summary of the average yearly record for each herd in different associations.
- (5) Issuing of performance certificates and entry into Herd Books.
- (6) Organising milk testing competitions and preparing entry for dairy cow competitions.

APPENDIX XXVIII.

NOTE ON SUBJECT NO. 32.

Subject.	Recommendation of the Animal Husbandry Wing.	Action taken by the Imperial Council of Agricultural Research Department.
1. To draw up a curriculum for the existing Veterinary Colleges, in India, with special reference to the necessity for improvement and unification of the present standards.	<ol style="list-style-type: none"> 1. The entrance qualification for Veterinary Colleges in future should be the Intermediate Science, F.Sc. (Medical Group) or its equivalent. 2. The words "Milk hygiene" should be substituted for the words "Dairy Science" in the curriculum proposed by the Sub-Committee. 3. In cases where only a 3-year course is possible, the curriculum drafted by the Sub-Committee on Veterinary Education should be adopted. 	The recommendations were considered and approved by the Advisory Board of the Imperial Council of Agricultural Research in August 1933 and forwarded to the Education, Health and Lands Department for necessary action. That Department has forwarded the same to the local Governments for information and such action as they considered necessary. For further developments attention is invited to Col. Olvar's note on Subject No. (1) of the Agenda for the 2nd Animal Husbandry Wing Meeting.
2. The importance of a thorough training in Genetics and the practical care and handling of stock of all kinds in Veterinary education in India and to make recommendations regarding further provision for such instruction at Indian Veterinary Colleges.	The Board considers that although it is not possible to teach much more than the principles of animal genetics in a three years' course, the importance of a thorough practical training in the care and handling of animal- for veterinary students cannot be over-estimated and that particular attention should be paid to this in devising a veterinary curriculum for the future. Owing to the fact that several of the existing Veterinary Colleges are located in large cities, it may be difficult to arrange for the location of a cattle farm in close proximity to them, but the difficulty can be met to some extent by running, in conjunction with the Veterinary Colleges located in urban areas, a model Dairy where the students will have daily opportunity of handling cattle. Another method of providing this continuous contact with animals in health, which is so necessary to veterinary students can be obtained by instituting a riding class, where this does not already exist.	The recommendations were considered and approved by the Advisory Board of the Imperial Council of Agricultural Research in August 1933 and forwarded to the Education, Health and Lands Department for necessary action. That Department has forwarded the same to the local Governments for information and such action as they considered necessary. For further developments attention is invited to Colonel Olvar's note on Subject No. (1) of the Agenda for the 2nd Animal Husbandry Wing Meeting.
3. The scope of Veterinary Entomology in India and the desirability of including this as a compulsory subject in the curriculum of Indian Veterinary Colleges.	The importance of the subject of entomology in veterinary education is recognised, but it is pointed out that in a 3 years' course it would not be possible to deal with the subject more than lightly and that for those intending to specialise in it a period of post-graduate study would be required.	Ditto. ditto.
4. To review the present position of the two journals published by the Imperial Council of Agricultural Research in which animal husbandry subjects are dealt with and to suggest the best arrangements for the future to insure prompt publication of original work and for keeping field workers in touch with important advances in animal husbandry matters.	<ol style="list-style-type: none"> 1. Any increase in the number of original articles appearing in the Indian Journal of Veterinary Science and Animal Husbandry should be dealt with by enlarging the size of the present quarterly issues, rather than by increasing the number of issues per annum. 2. (a) This journal should not accept clinical articles. 	<p>Considered and accepted, by the Editorial Committee at its February 1934 meeting. The principle has also been approved by the Advisory Board and is now followed in practice.</p> <p>(a) Considered by the Editorial Committee at its February 1934 meeting. While accepting the principle, the Committee recommended that important clinical articles should be collected together periodically and published as a Miscellaneous Bulletin. Necessary action has been taken on this recommendation.</p>

Subject.	Recommendation of the Animal Husbandry Wing,	Action taken by the Imperial Council of Agricultural Research Department.
<p><i>Animal Health.</i></p> <p>To suggest measures for the more effective control between provinces and States of contagious disease in animals, including consideration of the draft All-India Act on this subject.</p> <p>To examine the position in regard to the protection of animals against rinderpest in India and to make recommendations.</p>	<p>(b) Its Abstracting Section should be enlarged so as to provide a convenient medium for disseminating the results of scientific work carried out in other tropical countries to field workers in India.</p> <p>3. (a) In regard to Agriculture and Livestock, it is considered desirable that both in the matter of original articles and abstracts, it should cater almost entirely for the non-scientific practical man.</p> <p>(b) In addition to articles of this type from professional men, contributions should be invited from practical farmers on topical subjects, such as would be discussed in the market place rather than in the laboratory.</p> <p>This Board is of the opinion that the early adoption of the Contagious Diseases of Animals Bill will hasten co-operation between provinces and Indian States in the control of contagious diseases. Measures which may now be adopted prior to the passing of the bill are:—</p> <p>(a) Increase of staff.</p> <p>(b) The establishment of Frontier Quarantine Stations either with or without compulsory inoculation against specified diseases.</p> <p>(c) The extension and speeding up of interchange of reports of contagious disease between provinces and States.</p> <p>(d) Complete control of the Veterinary staff by the Provincial Head of the Department where this does not now exist.</p> <p>The Board is of the opinion that the Serum simultaneous method, in spite of its applications being limited by its cost, is still the most reliable method of immunisation of cattle against rinderpest in India.</p> <p>It is recommended that in the face of an outbreak, some form of virus inoculation together with an injection of suitable doses of anti-rinderpest serum should be adopted. In the absence of rinderpest, prophylactic inoculation should take the form of active immunisation. In view of their cheapness and ease of application, virus alone inoculations or vaccination deserve more extensive trial.</p>	<p>(b) Considered by the Editorial Committee at its February 1934 meeting. The Committee recommended a scheme for the publication in this Journal of abstracts of selected articles of practical interest from foreign literature and also a system of payment to abstractors of such articles. The scheme has been approved by the Advisory Board and the Governing Body and is now in operation.</p> <p>3. Both the recommendations were considered by the Editorial Committee at its February 1934 meeting. As regards (a), the Committee came to the conclusion that without excluding the kind of material now being published, special popular articles should be invited from chosen writers and payment should be made for such articles. This recommendation has been accepted by the Advisory Board and the Governing Body of the Imperial Council of Agricultural Research.</p> <p>(b) Approved by the Editorial Committee and noted for necessary action.</p> <p>Draft bill for the prevention and control of contagious animal diseases has been circulated to local Governments and their comments are under consideration. Model set of rules for certain diseases originally left out have been drafted. The Resolutions of the Board were communicated to local Governments and constituent States for information and such action as they deemed necessary, in the interest of the improvement of Livestock and the systematic development of livestock industries.</p> <p>The recommendations of the Board were communicated to local Governments and constituent States.</p> <p>2. In view of the altered position in this matter a further note by Animal Husbandry Expert on the present position of rinderpest in India has been widely circulated to all concerned.</p>

Subject.	Recommendation of the Animal Husbandry Wing.	Action taken by the Imperial Council of Agricultural Research Department.
<p>7. The most practicable methods of combating surra in equines and parasitic gastritis and fluke infestation of ruminants under field conditions in India.</p>	<p>1. It is recommended that further field trials as to the efficacy of prophylactic agents against surra and for the extension of treatment by the intravenous method should be undertaken in suitable areas.</p> <p>2. In regard to parasitic gastritis and fluke infection the Board is of the opinion that the prophylactic measures at present known are only applicable to controlled herds and flocks and cannot be applied under ordinary field conditions. It is considered that cheap measures of treatment are worthy of trial, the proprietary preparations being too expensive for general use. The Board particularly draws the attention of the Helminth Committee of the Advisory Board, Imperial Council of Agricultural Research to the problem of prophylaxis and treatment in view of their great importance.</p>	<p>The recommendations have been communicated to the local Governments.</p> <p>The problem of prophylaxis and treatment recommended by the Board remains to be placed before the Helminth Committee. This will be again considered when the Helminth Committee next meets.</p>
<p>8. The feasibility of taking concerted action for the control of rabies amongst dogs in India by the enforcement of single dose vaccination or other methods.</p>	<p>(a) This Board emphasises the urgency of the Government of India providing funds for carrying out important work in connection with the control of rabies.</p> <p>(b) Before recommending the compulsory application of any vaccination of dogs against rabies, the Board is of the opinion that extensive trials of vaccination under Indian conditions are necessary.</p> <p>(c) It is recommended that local Governments should take steps to enforce and extend the existing laws concerning the destruction of stray and ownerless dogs.</p> <p>(d) It is also for the consideration of local Governments and States in India whether the time has not now arrived when a dog licensing act should be introduced in each province and State.</p> <p>(e) The fees realised from such licenses would meet the cost of identity discs and recomp the cost of providing lethal chambers or other humane methods of destruction.</p>	<p>(a) The Animal Husbandry Expert considers that this is not a matter of financing schemes of research, it is a matter of organising control of rabies, the importance of which to human and animal health need not be emphasized. Such control must be mainly provincial and is largely a matter of police control at present.</p> <p>(b) A scheme for research on an anti-rabic vaccine for dogs was submitted by the Director, Imperial Veterinary Research Institute, Muktesar, and was considered by the Advisory Board of the Imperial Council of Agricultural Research in February 1936. The Advisory Board recommended that the Education, Health and Lands Department should be approached with a view to financing it as part of the normal work of the Imperial Veterinary Research Institute. This decision has been communicated to the Education, Health and Lands Department.</p> <p>(c), (d) and (e) These recommendations were communicated to local Governments.</p>

Subject.	Recommendation of the Animal Husbandry Wing.	Action taken by the Imperial Council of Agricultural Research Department.
<p>9. To review the position of Tuberculosis and Johne's disease in India and to suggest the best methods to adopt for their diagnosis and control.</p>	<p>The Board is of the opinion that :—</p> <p>(a) There is ample evidence to show that Tuberculosis and Johne's disease are widespread in India and constitute a serious menace to the improvement of cattle and dairy stock.</p> <p>(b) Further work in the field is required before the extent to which cattle are affected, can be determined with any accuracy.</p> <p>(c) Fundamental research at the Imperial Institute of Veterinary Research is urgently needed, particularly with regard to the improvement in methods of diagnosis and control.</p> <p>(d) The early appointment of a specialist officer, sanctioned for the Institute for this purpose, is an urgent necessity.</p>	<p>Funds have been provided for the recruitment of a special officer and staff for carrying on research at the Imperial Institute of Veterinary Research on Tuberculosis and Johne's diseases. Education, Health and Lands Department has been asked to take steps to recruit an expert bacteriologist. Another scheme in Mysore for investigation into Johne's disease is in progress.</p>
<p><i>Livestock Improvement.</i></p>		
<p>10. To review the results so far achieved in the crossing of the indigenous breeds of cattle by foreign breeds in the different provinces and States and the Military Dairy Farms and to consider its value in relation to the permanent improvement of livestock throughout India.</p>	<p>1. The Board considers that the results hitherto achieved in the crossing of indigenous breeds of cattle with foreign breeds indicate that this system of improving livestock in India, does not produce results of a permanent nature and is not suited to the ordinary conditions of the country.</p> <p>2. The Board appreciates the excellent results achieved on Military Dairy Farms but regards the methods used as in the nature of special requirements and not therefore applicable to India as a means of bringing about a permanent improvement of indigenous cattle. As a result of this opinion, the Board would express the wish that Military Dairy Farms should not dispose of any uncastrated European cross bred bulls, nor should they dispose of similar female stock, unless previously immunised against rinderpest.</p>	<p>Considered by the Cattle Breeding Committee of the Imperial Council of Agricultural Research at its meeting held in February 1934. The Committee recommended that the attention of local Governments and constituent States should be invited to the Bombay Cattle Improvement Act, as well as the action taken by the Punjab Government in the matter of compulsory castration. The Resolutions of the Animal Husbandry Wing and the recommendations of the Cattle Breeding Committee were communicated to local Governments. This subject is being further considered at the present meeting (<i>vide</i> subject No. 12 on the Agenda).</p>
<p>11. To consider whether pedigree Herd Books in the case of a few selected breeds can now be established for the lasting improvement of these breeds, particularly in regard to the development of dairy strains.</p>	<p>The Board considers that all India pedigree Herd Books can now be established in the case of a few well-known dairy breeds, commencing with breeds at present maintained on Government Farms and other institutions where reliable records are kept. In the case of other breeds it recommends that provincial herd registration, with the object of emphasizing the value of pure breed animals, should precede the more detailed individual records usually included under pedigree. The procedure adopted in the Bombay Presidency is recommended as a guide in this direction.</p>	<p>It was decided by the Cattle Breeding Committee and the Advisory Board that, to begin with, pedigree registration should be confined to dairy breeds of all India importance and that as a preliminary step in the establishment of herd books a brochure should be issued giving an authoritative definition of breed characteristics of selected breeds. Seven breeds, namely, the Sahiwal, Sindhi, Gir, Tharparker, Ongole and Kankrej cattle and Murrah buffaloes were accordingly selected and a convener appointed for each. The convener will get into touch with prominent breeders and in consultation with them decide on the best definitions. These after approval by the Council will be published in the form of a brochure, after which Herd Books will be started and maintained by the Animal Husbandry Bureau in collaboration with the provinces and States concerned with the breeds.</p>

Subject.	Recommendation of the Animal Husbandry Wing.	Action taken by the Imperial Council of Agricultural Research Department.
<p>12. To review the position as regards the methods hitherto adopted for encouraging the employment of improved sires including the systematic castration of scrub animals and to suggest practical means of extending them.</p>	<p>The Board considers that the methods adopted in various provinces and States for encouraging the use of suitable pure bred bulls all tend to produce the desired results and are only limited in their extent by financial consideration. They recommend that as in the Punjab, District Boards in other provinces should be empowered to provide funds for encouraging the use of suitable pure bred bulls and that the control of such funds should rest with the department controlling livestock improvements. As regards castration, the Board is of the opinion that the action taken in the Punjab by the local Government, empowering district Boards to frame regulations for the castration of scrub animals should be brought to the notice of other Governments.</p>	<p>The recommendation was considered by the Cattle Breeding Committee of the Imperial Council of Agricultural Research in February 1934 and its observations have been communicated to the local Governments and Indian States.</p>
<p>13. To review the effects of abortion, sterility and impotence on breeding operations amongst domesticated animals in India and to discuss the best methods for diagnosing and controlling these conditions.</p>	<p>The Board considers that considerable losses occur in the livestock industry from infectious and contagious diseases of the reproductive organs in both cattle and horses and that these are obviously important factors in the economy of herds and studs now maintained in this country. It is of the opinion that a very strong case has been made out for an early appointment of a special research officer to investigate these diseases.</p>	<p>This question was considered in detail by the Cattle Breeding Committee of the Council. Certain information in regard to the incidence of contagious diseases of the reproductive organs was collected and placed before the committee. The committee decided that this question required detailed examination and it was felt that this could be done only after the special officer at Muktesar, for whose appointment a special grant has been sanctioned by the Council, had taken charge. In the meanwhile, detailed information is being collected from the provinces in regard to the various causes of sterility and abortion of cattle, viz., contagious abortion, sporadic abortion, functional defects and nutritional deficiencies. The special officer is being recruited by the Education, Health and Lands Department.</p>
<p>14. To discuss the position of sheep breeding in India and to suggest practical methods for improving the quantity and quality of wool produced.</p>	<ol style="list-style-type: none"> 1. The Board considers that the problem of sheep breeding in hill tracts and in plains areas require separate treatment. 2. Sheep breeding is to a great extent in the hands of a nomadic class through whose agency any sustained effort towards improvement will be difficult. It is therefore desirable that all local Governments should interest themselves directly in this question and thereby encourage the land owning class to engage in this industry. 3. This can best be accomplished by the establishment in each province and State of selected flocks of the better indigenous breeds with the object of providing a nucleus of sufficient purity to render possible resuscitation of each breed. 	<p>The Imperial Council of Agricultural Research has approved three schemes of research on sheep breeding one each for Bombay, Madras and Punjab. The Punjab and Bombay schemes have already been financed. With a view to improve the methods of sheep breeding and to interest the local Governments in the improvement of local sheep, the Animal Husbandry Expert, to the Council, prepared a general note on the systematic improvement of poultry, sheep and goats. This together with the recommendations of the Animal Husbandry Wing having been forwarded to the local Governments for necessary action. This subject is being further considered at the present meeting (vide subject No. 14 on the agenda).</p>

Subject.	Recommendation of the Animal Husbandry Wing.	Animal taken by the Imperial Council of Agricultural Research Department.
	<p>4. The Board welcomes further sustained experiments on Government Stock Farms in the crossing of merines and specially graded indigenous breeds and in this connection would commend the scheme put forward by the Livestock Expert of Bombay Presidency to the Advisory Board of the Imperial Council of Agricultural Research.</p> <p>5. On account of the indifferent methods at present adopted in shearing, classifying and marketing wool, sheep owners in this country are not obtaining the full value of their wool. Efforts should therefore be made to remedy these defects by suitable demonstration to be conducted by Livestock Departments.</p> <p>6. The Veterinary Departments should increase their efforts to deal with the problem of the very large mortality occurring amongst sheep, particularly that due to parasitic diseases, which are at present strangling this industry.</p>	
<i>Animal Industry.</i>		
<p>15. To consider the figures obtained from the Military Dairy Farms regarding the comparative efficiency of Indian cattle, cross-breed cattle and buffaloes as milk and butter-fat producers, under Indian conditions in relation to the present and future requirements of dairying in India.</p>	<p>The Board is of opinion that (1) the statistical investigation of the comparative economic efficiency of various types of milch cattle in India already undertaken by the Imperial Council of Agricultural Research should be continued, (2) the investigations so far conducted should be published after further statistical analysis.</p>	<p>The services of the Statistical assistant appointed by the Council have been retained and the work is continued. The statistics collected have been published in the Council's Journal—Agriculture and Livestock in India. The staff employed on this work has formed the nucleus of an Animal Husbandry Bureau from the 11th April 1934.</p>
<p>16. To discuss the economic importance of the degeneracy caused in livestock of all kinds in India by insidious disease due to parasitic invasion of the blood and other tissues and by nutritional defects, and to suggest practicable methods for dealing with it.</p>	<p>The Board considers that—</p> <p>(1) Steps should be taken to demonstrate the value of efficient dipping to prevent infestation of stock by ticks and parasitic invasion of the blood and to devise means of extending such work in villages. One means to this end would be the use of cattle dips on all Government breeding farms.</p> <p>(2) The effect of the nutritional factor in the causation of disease and degeneracy among livestock in India requires thorough investigation.</p>	<p>(1) A scheme for tick control by dipping and spraying prepared by the Disease Investigation Officer, Bombay, has been approved by the Council and is awaiting allotment of funds. The recommendation has been commended to the local Governments for necessary action. The recommendation was communicated to all local Governments and constituent states of the Council with the suggestion that cattle dips should be employed on all breeding farms under their control for checking of tick-infestation as in the case of other countries.</p> <p>(2) The Animal Nutrition Committee of the Imperial Council of Agricultural Research considered this and suggested that the work now being done by the Disease Investigation Officers is likely to be of the greatest value in the prosecution of Animal Nutrition Research, and recommended that with a view to their investigation from the nutritional point of view, Director of Veterinary Services should be asked to forward brief special notes to the Animal Husbandry Expert, of any cases of cattle diseases apparently due to nutritional defects in particular localities. The Directors of Veterinary Services were asked accordingly and the replies received are under consideration.</p>

Subject.	Recommendation of the Animal Husbandry Wing.	Action taken by the Imperial Council of Agricultural Research Department.
17. To consider the economic importance of the poultry industry in India and to make recommendations for its development.	<p>The Board is of opinion that—</p> <p>(1) The improved marketing of poultry products on co-operative basis is essential and recommends that the attention of the Departments interested, in provinces and States, should be drawn to the importance of undertaking such work.</p> <p>(2) Satisfactory progress in the development of a poultry industry in India will not be practicable until a central institute is established under expert control to make a systematic study of poultry diseases, along with the proper care of poultry under Indian conditions.</p> <p>(3) The possibility of marketing eggs in various forms, e.g., preserved or dried, is a subject needing early investigation.</p>	<p>(1) & (3) The Provincial Economic Conference which met in 1934 recommended the establishment of a Central Marketing Office and the financing of marketing staff in the provinces. The scheme has been inaugurated from 1st January 1935. The items of enquiry under the scheme include the marketing of livestock and livestock product, including poultry. The survey is in progress.</p> <p>(2) The establishment of a Central Poultry Institute, at Iztanagar, has been approved by the Government of India. The Imperial Council of Agricultural Research has also approved a scheme for researches in poultry diseases.</p>
18. To discuss the practicability of developing dairying as a village industry in India along with the organised marketing of eggs and other animal products.	<p>The Board is of opinion that in order to develop the dairy industry of India on scientific lines it is necessary to have a much enlarged central institute at which, in addition to the training of students, more extensive research and investigation of the problems of dairying in India can be carried out.</p>	<p>The Government of India have sanctioned, on the recommendation of the Provincial Economic Conference, a sum of Rs. 8 lakhs for the establishment of an experimental creamery at Anand, and the extension of the existing Imperial Dairy Institute at Bangalore, for research and educational purposes. The Imperial Council of Agricultural Research has also approved a supplementary research scheme at the Anand Creamery.</p>
19. The extent of warble fly pest in India and the organisation necessary for dealing with it.	<p>The Board considers that—</p> <p>(1) A statistical survey should be undertaken, designed to give information in regard to the regional distribution and seasonal prevalence of the warble fly in India.</p> <p>(2) The research work now in progress at the Imperial Institute of Veterinary Research, Muktesar, on the life history and bionomics of warble flies, should be continued in order to discover practicable means of control.</p>	<p>(1) Steps have been taken to collect information regarding the seasonal prevalence and regional distribution of warble flies, and to place it at the disposal of the Imperial Veterinary Research Institute, where a research scheme to study the life history and bionomics of warble flies will soon be started with financial assistance from the Imperial Council of Agricultural Research.</p>
<i>Animal Nutrition.</i>	<p>The Board recommends that where over there is evidence that a disease cannot be definitely attributed to any specific source, other than malnutrition, the question of malnutrition should be exhaustively studied by some special official or by a team of workers working in collaboration with others pursuing the enquiry from different angles of vision.</p> <p>It is further recommended as specific instance that the parental blindness and the blindness in calves in Baluchistan and Sind and Kurni of horses which are causing very serious loss to the country should receive special and immediate attention along these lines.</p>	<p>This has been dealt with at the Imperial Veterinary Research Institute, Muktesar.</p>
20. The necessity for investigation of the part which malnutrition plays in the incidence of disease and for extending and co-ordinating research into cognate problems of animal disease and animal nutrition in India.		

Subject.	Recommendation of the Animal Husbandry Wing.	Action taken by the Imperial Council of Agricultural Research Department.
	<p>The Board further feels that in addition to the investigation of special diseases apparently due to specific deficiency, the general question of the relation of mal-nutrition to disease requires a much more extended investigation in which the work of all existing agencies should be correlated and enlarged. To attain this object the workers engaged in this study should be given an opportunity to meet and prepare a scheme.</p>	
<p>21. To consider the position of research into equine nutrition in India, including the systematic investigation of the composition of available fodders and necessity for devising practicable methods of improving grazing areas and the quality of hay produced under Indian conditions.</p>	<p>The Board considers that the improvement in the quality of grazing areas, rotational grazing is the best procedure and silage making is recommended as a method of conserving any excess grown.</p>	<p>The Animal Nutrition Committee of the Imperial Council of Agricultural Research considered the resolution and recommended that no action was at present necessary as research work in the nutritional aspect of silage was already in progress.</p>
<p>22. The need for respiration work in connection with animal nutrition research in India.</p>	<p>The Board considers that respiration work on animals is of fundamental importance in obtaining knowledge as to how the animal treats the final products of digestion of its ration. In other words, it is essential for obtaining the complete picture of the nutritive value of any foodstuff.</p>	<p>This question was discussed at the February 1935 meeting of the Animal Nutrition Committee, and definite proposals were made for the establishment of an Animal Nutrition Institute. On the basis of these proposals, the Government of India transferred the animal nutrition laboratory from Bangalore to Izatnagar and constituted an animal nutrition section at the latter place.</p>
<p>23. Minerals in Indian pastures and fodders and the mineral requirements of stocks.</p>	<p>The Board recommends that systematic work should be started on the analysis of the mineral content of fodder and food stuffs. In order to ensure uniformity of procedure Dr. Lander should be requested to prepare a scheme of work in consultation with the provinces in regard to the procedure to be employed. The Board desires to stress the fact that an investigation in the mineral requirements of dairy cattle is of outstanding importance to India.</p>	<p>The matter was referred to the Animal Nutrition Committee at its meeting held in September 1935 and it was decided to appoint an <i>ad hoc</i> committee comprising experts in different branches of such work. Such a committee will be appointed during the forthcoming meeting of the Advisory Board. It was not possible to constitute the committee earlier as a member of Animal Nutrition research workers were on leave ex-India.</p>
<p>24. The importance of blood analysis in animal nutrition work.</p>	<p>The Board considers that— (1) The work which Mr. Warth proposes to carry out at Bangalore on blood analysis is of great economic importance and its prosecution should be encouraged. (2) The Imperial Institute of Veterinary Research, Muktesar and the Physiological Chemist section of the Imperial Institute of Agricultural Research at Bangalore should collaborate in this work.</p>	<p>The transference of the Animal Nutrition section to Izatnagar by the Government of India meets this.</p>

Subject.	Recommendation of the Animal Husbandry Wing.	Action taken by the Imperial Council of Agricultural Research Department.
25. The organisation necessary for the future development of Animal Husbandry in India.	The Board resolved that three permanent sub-committees of the Board of Agriculture, each consisting of four members, should be formed under three heads, viz., (a) Animal nutrition, (b) Cattle breeding and (c) Dairying, to deal with these branches of animal husbandry work. It was further decided that the chairman should fix the personnel of these committees in consultation with Colonel Oliver.	The three standing committees have been appointed. In this connection attention is also invited to a note by Colonel A. Oliver, Animal Husbandry Expert, on subject No. 35 of the Agenda.
26. To review the position in regard to the reporting of mortality and sickness among stock and to consider in what ways it might be better controlled so as to insure more accurate recording and more prompt notification of outbreaks of contagious disease.	The Board noted the papers submitted on the subject. No recommendation was made.	No action.
27. To consider the question of undertaking a systematic survey of the livestock wealth of the country, with the publication of a review on the lines of "Livestock of Great Britain" published by the Ministry of Agriculture in England, including the classification under which quinquennial census of cattle in India should be made.	The Board recognised the necessity of collecting statistics in connection with livestock but recommended the postponement of actual work in this connection until financial condition improved. It also decided to form a sub-committee to go into details of the question of reclassifying the heads under which cattle census returns should be made in future.	The heads under which cattle census returns should be made in future was considered by a sub-committee of the Advisory Board, and the revised classifications recommended by the sub-committee have already been utilised for the livestock census, January 1935.
28. The necessity for more thorough inspection of meat, milk and dairies in cities and rural areas and to suggest practicable ways and means of financing and carrying out such work.	The Board recommended that for the protection of health and for the development of the Dairy Industry all legislation for the prevention of adulteration of dairy products should be made obligatory on local bodies and not optional. It was decided to appoint a small sub-committee to examine in detail the matters dealt with in the above resolution and that the terms of reference of this sub-committee should be (1) the examination of existing legislation and its application to milk, butter and other dairy products and eggs in the areas both of production and consumption, and (2) to meat inspection. It was resolved that this sub-committee should report to the Advisory Board of the Imperial Council of Agricultural Research.	Attention is invited to notes on subject No. 38 (a) and (b).

NEW DESHT;
The 4th December, 1936.

BAZLUL KARIM,
Offg. Secretary.

APPENDIX XXIX.

NOTE ON SUBJECT No. 33.

The first Animal Husbandry Wing meeting held in February 1933, recommended that for the protection of health and for the development of the dairy industry all legislation for the prevention of adulteration of dairy products should be made obligatory on local bodies and not optional. It was decided to appoint a small sub-committee to examine these questions in detail, its terms of reference being "the examination of existing legislation and its application (1) to milk butter and other dairy products and eggs in the areas both of production and consumption, and (2) to meat inspection".

2. In accordance with the above recommendations the Imperial Council of Agricultural Research appointed a committee called the Dairy Legislation Committee to consider the matters dealt with in the Resolution quoted above. The Dairy Legislation Committee, at its meeting held in March 1934, considered the above recommendations and decided that before arriving at any definite conclusion it was important to obtain first-hand information in regard to the measures of control at present in force in certain particular localities. To implement this decision, four sub-committees were appointed to visit Coimbatore, Bombay, Calcutta and Dacca and Karachi. The reports of the four sub-committees were considered by the main Committee at its meeting held in July 1935. This Committee decided that an All-India Act for regulating the standards of dairy products was essential and that legislation should be central, but it should be permissive in the beginning and that local Governments should have power to extend it by notification to the whole of the province or to particular areas in the province. The committee agreed that uniform standards should be prescribed for the whole of India in regard to Butter and Ghee and that for other products the local Governments should be given power to adopt standards or not.

Dairy Legislation.

3. The committee also decided that the opinion of the local Governments should be obtained in regard to legislation for dairy products and the best way of doing it was to prepare a draft bill and to circulate it to the local Governments along with other material. The Dairy Legislation Committee therefore appointed a sub-committee consisting of the following members to draft the bill :—

Animal Husbandry Expert.

Imperial Dairy Expert.

Prof. A. C. Aggarwala, Punjab Veterinary College.

4. The draft bill has been prepared. In order to ascertain local variations in the existing law in the provinces and to discover lacunae in the existing legislation, local Governments have been requested to furnish the Imperial Council of Agricultural Research with copies of the legislative measures dealing with adulteration in general and the subjects mentioned below in particular :—

(i) Acts dealing with the prevention of adulteration of foods.

(ii) Acts conferring powers on Municipalities or other local authorities to frame bye-laws relating to the production and distribution of milk and milk products.

(iii) Bye-laws and rules, including license forms adopted by Municipalities and other local authorities in the provinces.

5. Replies from all the local Governments have not been received. As soon as they are received the draft already prepared will be examined *vis-a-vis* existing legislation and the whole material placed before the Dairy Legislation Committee and the Advisory Board, and further action will be taken in due course.

6. In proceeding with this bill a constitutional difficulty has however been met, viz., that the Government of India Act of 1935 debars the Central (Federal) Government from legislating in such matters, *vide* items 14 and 20 in List II of 7th Schedule covered by sub-section 3 of section 100 of the Act (Annexure I). Suggestions are invited as to how this difficulty may be overcome. The Animal Husbandry

Expert, Imperial Council of Agricultural Research, is of the opinion that the procedure adopted by the Federal Government in the United States of America might be followed in this case, *viz.*, that a code might be framed and recommended to provinces and states for adoption.

Meat legislation.

7. The Dairy Legislation Committee, in July 1935, also appointed a sub-committee consisting of the Animal Husbandry Expert, Prof. Aggarwala and Mr. J. R. Haddow to draw up model rules on meat inspection for the guidance of Municipalities, local bodies and others concerned and to place these model rules before this meeting.

8. The model rules (not printed) have been drawn up and were circulated to the Public Health Commissioner with the Government of India and to all local Governments, minor Administrations and constituent states of the Imperial Council of Agricultural Research. The remarks so far received are shown in the attached statement (not printed).

BAZZUL KARIM,
Offg. Secretary.

NEW DELHI;

The 14th November, 1936.

ANNEXURE I.
SEVENTH SCHEDULE.

LEGISLATIVE LISTS.

* *
* List II.

PROVINCIAL LEGISLATIVE LIST.

* * * * *
14. Public health and sanitation; hospitals and dispensaries; registration of births and deaths.

* * * * *
20. Agriculture, including agricultural education and research, protection against pests and prevention of plant diseases; improvement of stock and prevention of animal diseases; veterinary training and practice : pounds and the prevention of cattle trespass.

* * * * *

Sub-section (3) of section 100 of the Government of India Act.

(3) Subject to the two preceding sub-sections, the Provincial Legislature has, and the Federal Legislature has not, power to make laws for a Province or any part thereof with respect to any of the matters enumerated in List II in the said Schedule (hereinafter called the "Provincial Legislative List").

APPENDIX XXX(a).

NOTE ON SUBJECT No. 34, BY MR. F. WARE, F.R.C.V.S., I.V.S., DIRECTOR,
IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.

The Grazing Problem in India.

The title of Subject No. 34, on the agenda of this Meeting is "The better utilisation of forest areas for grazing", but this note has been prepared on the general question of grazing in India, and it therefore covers rather a wider field.

Since the issue of the report of the Royal Commission on Agriculture in 1922, considerable advance has been made in many of the subjects dealt with in the report, but one subject of which this cannot be said is that of grazing. It was discussed briefly at the last meeting of the old Board of Agriculture in 1929, when two general resolutions emphasizing the necessity for conserving and making better use of existing grazing grounds were passed, and it was again proposed for discussion at the first meeting of the Animal Husbandry Wing of that body in 1933, but unfortunately it was crowded out by the very heavy programme on the agenda for that meeting. It has, it is true, been given some consideration in recent years in the different provinces, but in very few of them has any sustained effort yet been made to effect improvement and in no province have the main recommendations of the Commission been adopted.

The subject is dealt with very exhaustively in Chapters VII and VIII of the Report of the Commission and no attempt is made to minimise the difficulties of the problem; in fact both the difficulties and the importance of the subject are stressed in the following sentence :—

"We are well aware of the difficulties likely to be met with in practice in getting owners of cattle to adopt more rational methods of utilising the diminishing grazing areas of India, but the poverty of so large a proportion of the breeding herds or the country is such a serious handicap to the improvement of agriculture, and the management of the available grazing lands is so bad, that a great effort to alter existing conditions is necessary, and is indeed long overdue."

These words were written 8 years ago, and there appear to be two very cogent reasons why the problem should be tackled in earnest without any further delay. The first is that what was described by the Royal Commission as "pressure on the land" from an increasing human population is a matter of still greater concern since the issue of the latest census figures which show a 10 per cent. increase in the last decade. The demand for cultivable land is, therefore, certain to increase.

The second reason, which is particularly the concern of Animal Husbandmen, is that the provision of better grazing facilities is a necessary adjunct to any campaign for the improvement of India's cattle population, particularly that most essential item, the working bullock.

In order to make the position clear, it should be explained that cattle are kept in this country mainly for three purposes :—

- (a) For the provision of milk to large towns, hill stations, etc. For this purpose the best cows available are imported, stall fed, and the young stock are generally neglected.
- (b) For the production of a general utility animal, usually with the help of special fodder crops. The number and size of such areas is small at present but they may be expected to increase as marketing facilities are developed, for the incentive to the production of this class of animal is sale, either of the animal itself or its products.
- (c) For the production of working bullocks. The vast majority of villages in India fall into this group, and it is the group to which the recommendations of the Royal Commission particularly apply, not least because for the production of the best type of working bullock grazing land is essential.

Moreover this group is important for the reason that, owing to inferior methods of cultivation, the great majority of the ryots living in these villages are not able to produce sufficient food even for their families, so that their animals willy-nilly have to depend for their living on what grazing is available, with merely the

residue of the crops grown for human consumption thrown in. Also it may be observed that as methods of cultivation improve the most probable result will be a further increase in human population, unless the advocates of birth control are able to make headway. In any case there is little likelihood of any widespread movement in favour of growing special fodder crops taking place in these areas in which the primary consideration is the production of working bullocks.

We are, therefore, forced to the conclusion that this question of grazing is, and is likely to remain for any ordinary period of time, a most vital one to the vast majority of villages in India. These villages, i.e., those in group (c), can again be divided into 2 main classes, viz. :—(i) those which at present have no suitable grazing for their young stock within a reasonable distance, and (ii) those which are either adjacent to grazing grounds or from which the animals can be taken to grazing areas at certain seasons of the year.

As regards the first class if, even after reclassification, no suitable grazing land is available, it seems that the only advice that can be given is to practise restricted breeding, and disposal of the unfit. The cows give insufficient milk even for their seldom-produced calf, and it would make matters worse to attempt to introduce higher yielding animals, which would require more food. The bullocks are of very little value as such, and in some parts are mainly kept for the production of manure for fuel. In these villages it will be found that there are usually a few better class bullocks purchased from outside and it would obviously help these unfortunate ryots if their facilities for obtaining suitable bullocks at a reasonable cost from the areas falling under (ii) could be improved.

This, therefore, brings us to class (ii), i.e., those villages which are adjacent to actual or potential grazing areas and in this connection it may be pointed out that some of the most valuable grazing areas in the country are to be found in Indian States, who are therefore very much concerned with this problem.

As regards British India the Royal Commission points out that of the total area of land about 20 per cent. of it is administered by the Forest Department and 45 per cent., is classified as "cultivable waste", or "land not available for cultivation", and it makes the recommendation that in the case of both these areas the classification should be re-examined with a view to providing better grazing facilities for India's livestock. With reference to the area now administered by the Forest Department the Commission states "The ideal to be aimed at in all provinces is to distinguish between land which is suitable for the growth of good timber trees or for fuel plantations and land which is suitable neither for timber, fuel plantations nor for ordinary cultivation, but may possess possibilities for development as fodder reserves and grazing grounds". Action on these lines has, of course, already been taken in some provinces, notably in Madras, where the formation of Panchayat village forests has been encouraged on a large scale, but it appears that the Commission did not contemplate any large extension of this arrangement but rather that such grazing lands, after reclassification, should be administered by a special branch of the Forest department as a demonstration of what can be done under scientific control. In regard to these Forest grazing areas the Commission states: "Because of their small commercial value and also because the important forests give scope for all the energies of the existing forest staff, little attention has been given to the development of the second type of forest property. Nor do we think it likely that it will ever receive the attention that should be given to it unless it is placed under the management of a division of the Forest Department directly responsible for its development."

Turning now to the areas classed as "cultivable waste" and "land not available for cultivation", the Commission remarked: "We think it likely that within these vast areas there could be found much land which, although unsuited for commercial afforestation, might, if placed under the charge of a minor forest division, be used to grow fuel and provide better grazing than it now does."

The Commission realized well enough that to effect any improvement time and money would have to be spent and a good deal of close study given to the problem by officers specially selected and trained for the purpose, but they conclude their remarks with the statement: "We are satisfied that share of the attention which has hitherto been bestowed on the valuable section of the country's forest property should now be spared for, and concentrated on, the problems presented by that section of the forest land now regarded and treated as waste."

Quotations have been made from the Commission's report *in extenso*, for the recommendations made are far reaching and appear to offer one of the very few practicable means of finding a solution for the greatest problem confronting Animal Husbandmen in India today, *viz.* :—the provision of more and better food for her cattle, and this again, it may be observed, is only part of the bigger question of the Nutrition of both her human and animal populations.

A plea is, therefore, put forward that a deeper study of this intricate problem should be made in all provinces, and as an example of what may be done, even with most unpromising material, the grassland improvement recently effected in North Wales may be quoted.

The items of work which seem to call for early attention in this country, if better use is to be made of grazing lands, are the following :—

- (i) Soil and plant surveys.
- (ii) Analysis and feeding trials of fodder from typical areas.
- (iii) Introduction of new grasses, legumes, edible shrubs, etc.
- (iv) Prevention of erosion by "bunding" and other simple methods.
- (v) Provision of a well-distributed supply of drinking water.
- (vi) Pasture management including controlled and rotational grazing, fencing, etc.
- (vii) Possibilities of fodder conservation—dry storage and ensilage.
- (viii) The restriction, where possible, of the number of permits issued for grazing, so as to allow of the proper development of the area and preservation of desirable grasses.
- (ix) The permanent protection of all animals against Rinderpest before permits are issued.
- (x) The castration of all scrub bulls with two teeth or over, unless an enhanced grazing fee is paid.

Before the above improvements can be introduced on a scale sufficiently large to make any appreciable contribution to the food problem in India however, it will be necessary to set up a Commission, to investigate the question of re-classifying the existing land, as recommended by the Royal Commission on Agriculture, and this having been done, the next step will be to assign to one department, or division of a department, the duty of developing the areas set apart for grazing to their fullest capacity.

APPENDIX XXX(b).

NOTE ON SUBJECT NO. 34, BY MR. F. CANNING, C.I.E., I.F.S., OFFG. INSPECTOR GENERAL OF FORESTS.

Statistics of Forest Grazing.—Out of the total land in the charge of the Indian Forest Department (2,81,511 square miles) nearly half (1,23,185 square miles) lies in Burma, where the grazing question is of minor importance owing to the sparseness of the population. We are chiefly concerned with the remaining 1,58,326 square miles in India proper. Out of this total forest area, 85,191 square miles are open to grazing but the incidence of grazing varies enormously. The higher Himalayan forests are practically unused, and the great belt of forest along the foot of the Himalayas in Bengal and U. P. is out of reach of the cultivators; in fact, out of 43 million head of cattle in U. P. only one million, or 2½ per cent., make any use of forest grazing areas. In the Punjab the foothills belt is much more densely populated and thus the forests are much more heavily grazed. In the C. P., Bombay and Madras, also, the agricultural population makes greater use of the forests, which are here interspersed among cultivation. Even so, grazing is generally confined to the outer fringes of each forest block, so that figures of general incidence do not give any true indication of the tremendously heavy incidence which occurs in many localities. The value of grass and grazing obtained from forests free or at concession rates varies from over Rs. 14 lakhs in the Punjab for 5,188 square miles of forest, to 22,957 rupees in Assam for 21,505 square miles.

Extent of Problem.—It must be remembered that the forest grazing problem is only one part of the much larger problem of Indian animal husbandry as a whole, and that the obvious remedies indicated by the Royal Commission on Agriculture for the general improvement of farm animals and the means of feeding them, apply equally to communities dwelling in or near forest tracts. There are however additional considerations applying to the interaction of grazing and forest management which makes it all the more essential that the vast numbers of excess cattle maintained by most village communities living near forests should not become a drain upon forest resources. Many of the early forest settlements were so liberally framed that no check can be exercised upon the number of animals which can graze in a given forest area, and with the phenomenal growth of population and of live stock under the protective influence of British rule, what was originally a reasonable privilege to graze a few head of cattle has now grown into an intolerable burden of overgrazing, which not only ruins any chance of improving the forest silviculturally, but in many cases is leading to active erosion and the eventual disappearance of any vestige of woodland or even of grassland.

Classification of Grasslands according to Rainfall.—The Agricultural Department has proved by practical demonstration that while continuous, unlimited, and uncontrolled grazing creates definite deterioration, grazing in itself when properly regulated is not necessarily an evil even in intensively managed timber forests. Even intensive grazing, provided it is properly controlled and not continuous, will allow the vegetation to follow out its natural progress towards an ecologically higher type of plant community. But the actual amount of grazing which will not interfere with such progress depends largely upon the amount and distribution of the rainfall. We can thus classify all forest grazing grounds into one of two classes which are separated roughly by the 50 inches of rainfall mark.

In the heavy rainfall class with anything over 50 inches the natural vegetative cover which tends to develop is some form of dense tree forest, in which grassland is sooner or later ousted by tree growth, and if grasses occur they tend to be large perennials of coarse and fibrous texture. In such conditions any attempt to improve the grazing quality of open forest or scrub land must involve interfering with the natural tendencies of nature by delaying the advance of denser jungle. Timber production and grazing improvement are therefore incompatible in such areas.

In the areas of light or deficient rainfall, however, things are quite different. Here grasses rather than trees form the major part of all natural crops in all stages of development and even the ideal or climax forest generally contains a large amount of grass. Moreover the highest species of grass, in an ecological sense are also the most valuable for feeding purposes, because leafy annual grasses are not as a rule ousted by the coarser perennial fibrous ones on such sites. In the dry zone the best fodder is as a rule found on the damper sites. Maltreatment by continuous overgrazing will inevitably throw such areas back to a less valuable

fodder type as well as causing deterioration of the forest, while better utilization of the fodder is synonymous with better forest management. It is in such areas of light or deficient rainfall that Dr. Burns illuminating experiments on grazing in Bombay have been made and it is obvious that it is in such areas that the Forest and Agriculture Departments can best co-operate in demonstrating better utilization of forest grazing.

Findings of the Royal Commission on Agriculture in India.—The recommendations having a direct bearing upon the forest grazing problem were as follows (page 276 of Commission's Report):—

1. Grass cutting should be encouraged as an alternative to garzing.
2. The grazing of inferior cattle in the forests should be discouraged.
3. The intensity of grazing consistent with the proper development of the forest and the preservation of desirable grasses should be determining as soon as possible.
4. Forest areas in each province should be classified with a view to determine which are most suitable for the growth of timber, for preservation under forest on physical grounds, or for development as fodder reserves and grazing grounds.

Of these, Nos. 1 and 2 are largely dependent upon the wider question of the improvement of stock as a whole. The Forest Department cannot progress far in substituting grass cutting for grazing unless and until the villagers have cattle for which it is worth cutting grass. Even partial stall-feeding is only worth while for picked animals and is out of the question for large herds of semi-starved animals. Similarly the grazing of inferior cattle in forests cannot be discouraged actively until the larger problem of reducing the numbers of surplus cattle has been taken in hand.

Nos. 3 and 4 also seem to be rather superfluous until more practical steps have actually been taken to reduce the incidence of grazing where it is obviously excessive. There is little point either in knowing the proper intensity of grazing for any given site, or in segregating land for timber production, when the forest is in actual fact deteriorating rapidly through overgrazing.

Below is given a summary of the position in the provinces, considered under the two heads of the Agenda for consideration by the Committee of Forest Officers. This summary is supplemented by extracts or complete notes (the time for the preparation of which has been short) from various provinces given in annexures.

SUMMARY OF THE POSITION IN THE PROVINCES.

(i) Grazing in Forest Areas.

Assam.—The grazing in areas under the Forest Department is infinitesimal and the grazing problem is not acute.

Bengal.—

1. Northern Bengal.—(a) Hill Forests.

The system of building cattle sheds at Government expense and charging a nominal fee for grass cutting has been a success in Darjeeling and Kurseong forest divisions from a forest point in view. Originally the herds of cattle at open graze in the hills were mostly of a draft strain yielding little milk. The institution of stall feeding has led to the production of a cross breed producing a heavier yield of milk; at the same time there are signs that their capacity as draft animals is deteriorating. This can possibly be remedied by the Agriculture Department by preventing the in-breeding which is now going on. Kalimpong Forest Division on the other hand has made repeated attempts to introduce stall feeding without success, because of the large areas under Government tenants outside reserve forest. Attempts are still being made. It is not a fact that these forests are too dense to produce good fodder herbs. Although grass is scarce there are many herbs which produce good fodder and it has become one of the department's principles to grow forest crops of such a nature in such a way as to produce a plentiful supply of these herbs. However the supply during the winter will always be insufficient and I suggest that silo systems might well be introduced by the Civil Departments, as has been done by St. Mary's College Farm at Kurseong with gratifying success.

(b) *Duars* along the foot of the hills.

These are the only plain forests in Northern Bengal and consist of too large blocks too remotely situated from villages to be of any practical use as grazing grounds.

II. *Southern Bengal*.—There is of course no grazing in the Sunderbans. Open grazing is permitted throughout most of the Chittagong and Cox's Bazar divisions. *Eupatorium* invades the grazing grounds, but must be pulled out by hand and not cut back. The former operation is extremely easy when the ground is soft. In the new Dacca Division, grass cutting and later grazing is allowed in that coppice crops which produce a good growth of grass. Grass is entirely absent in the high forest of that division and so little grazing was obtainable in the Sal forests there, until the Forest Department took over the management. In the Chittagong Hill Tracts Division all grazing necessary is obtainable from the Unclassed State Forest where shifting cultivation is practised.

Bihar.—Government forests here are only 3 per cent. of the province and are true forests with no natural grass-land. Where grazing is allowed it is governed by rotational closures under the working plans.

Bombay.—Much work has been done on an experimental scale by the Agricultural Department herein grass improvement, particularly in the dry tracts, proving clearly the need for fencing, limitation of head of cattle, prevention of grazing during early monsoon, provision of watering facilities, and tree planting for sheds. The Forest Department as tenant of a large portion of the true grazing land has co-operated in this work and has already arranged for proper grazing rotations and facilities in several of their Working Plans notably that for the Junner forests in the East Khandesh Division. There each grazing unit, averaging about 500 acres is divided into 5 sub-units each of which received closure for rest and seeding at fixed intervals during a 5-year period. In addition 36,000 acres are set aside for cutting each year before grazing. Under the revised plans for Poona and Satara divisions also special provisions have been made for the introduction of controlled rotational grazing on the lines of the results obtained by the experiments carried out by the Agricultural Department. The Grazing Rules provide for the limitation of head of cattle by the Collector, but this has never been made use of, and excessive grazing is almost universal to the detriment of both the stock and the grazing grounds. The problem is particularly serious in the Bombay Presidency's dry tracts.

Burma.—As explained in the introductory notes, the question of grazing improvement is a minor matter in Burma, and this province may be omitted altogether from the discussion.

Central Provinces and Berar.—Government Forests represent about one-fifth of the total area of the province and about 86 per cent. of these forests are open to grazing. In Berar grazing is for the most part only available in Government Forests; in the Central provinces the Government forests are often very irregularly distributed but there are large areas of private forests besides the reserves.

Whenever a working plan for a forest division is prepared (every 10–20 years) a grazing settlement is made as a result of consultation of Forest and Revenue Officers. The grazing incidences in the various classes of forest are approximately:

Tree forest Moist type 4 acres per head.

Dry type 3 acres per head but 2 acres in teak forest.

Scrub forest pasture 1 acre per head.

Open pasture none.

Grass cutting is encouraged and periodical or rotational closures are allowed.

Madras.—Only about 12 per cent. of the departmental forests are closed to grazing. The average incidence of grazing is 5.32 acres but it is much heavier on the edges of the reserves and the forests are overgrazed. It is not possible under the present system to limit cattle grazing to the possibility, nor to give preference to superior cattle, nor to close areas to grazing for a sufficient period after the rains to allow grass to grow. Grazing fees vary from three annas to one rupee per cow for the whole year averaging about eight annas. The question of enhancing fees has been kept pending owing to the prevailing agricultural depression.

Experiments to introduce better strains of grasses have been made but cannot say unless special fees are charged for grazing in the improved areas. Grazing grounds have been cleaned of prickly pear by the Cochineal insect. Water supplies

in grazing grounds have received some attention. Rotational grazing has been started experimentally. The Kancha system of the Nellore division is interesting; grazing areas leased with special conditions to maintain or improve the quality of the grazing. These arrangements have fostered the production of superior cattle.

North-West Frontier Province.—The remarks given below concerning the Punjab apply generally also to this province.

Orissa.—Only 3 per cent. of the old province of Bihar and Orissa are Government forests. Damage from grazing in forests under the Forest Department is not extensive. The forests contain few true grazing grounds but available areas are open to grazing under control.

Punjab.—It has been fully realised for many years past by all forest officers in the Punjab that very rapid and wide-spread deterioration was taking place in almost all the foothill forests through over-grazing. Several papers and publications have emphasised this. The historic examples of the Hoshiarpur *ekos* and the denudation and erosion which is rapidly ruining the grazing value of the foothills grazing grounds are undeniable facts which are only slowly penetrating to the notice of a wider public. Unfortunately very little can be done until public opinion has come in on the side of regulation and restriction of grazing, and legislators dependent upon popular vote will not risk a loss of popularity by taking up restrictive measures. We as forest officials know fully well what is required, but there is no possibility of carrying out what is necessary unless and until the grazing communities of the foothills can be persuaded to try restriction of grazing in their own interests. Meanwhile widespread deterioration goes on apace and gets obviously worse each year that proper management of the grazing grounds is delayed.

Sind.—The Sind forests are of relatively small importance in so far as the cattle of the Province are concerned. On an average some 45,000 horned cattle are grazed annually or less than 3 per cent. of the total head of cattle. 15 acres of forest are therefore available for each head of cattle grazed. This position is reasonably stable, and is to be accounted for by the distance of the riverain forests from the main centres of cultivation, by facilities for grazing on waste lands and by the system of stall feeding. There is therefore at present no grazing problem in Sind, nor does it appear probable that any difficulty will occur in the near future.

United Provinces.—In the United Provinces, large herds of cattle are frequently kept largely for manure and fuel, which in the absence of alternative sources of supply, are required in unlimited quantities. There can, therefore, be no real surplus of cattle for this unlimited objective, unless alternative sources of supply are made available.

2. in the forest areas of the United Provinces, there is no insuperable grazing problem. In the moist savannahs or natural grazing grounds, no limitation of grazing is required. In the dry tree forest type of grazing grounds, grazing is limited and under control, and the forests are not deteriorating owing to overgrazing. On the contrary, the forests are steadily improving with sound silviculture.

3. The total head of domestic animals that graze in forest areas is 1½ million. or one animal per two acres open to grazing, which is not excessive. About 68 per cent. of these animals that graze in forest areas are free by right or long standing concession. Any attempt to prohibit or reduce or limit their rights and concessions would be politically a mistake, and in fact there is no justification for such action.

4. The real grazing problem of the Province lies in the waste lands outside the forests, where the incidence rises to a preposterous figure of nearly 5 per acre. Out of a provincial total of 43½ million domestic animals, 42 millions do not visit the forests.

5. the possibilities of increased fodder production and better utilisation of grazing grounds may be summarised as follows, whether forest areas or waste lands:—

(i) The moist savannahs are the ideal grazing grounds provided by nature, and no improvement is possible.

(ii) In the dry areas fit for tree growth, increased fodder production is possible mainly by increased leaf fodder, and by creating plantations for lopping.

(iii) In dry areas unfit for tree growth, increased fodder production (of grass and hay) is possible mainly by substituting grass cutting for grazing.

No. (i) calls for no action, No. (ii) is being actively developed in certain forest areas, but the possibilities of further expansion might be explored. Nos. (ii) and (iii) are both applicable to waste and zamindari lands, but propaganda and expert advice will be necessary to achieve results.

(ii) *Grazing in Ravines and Derelict land outside Government Forests.*

Assam.—The control of all grazing outside reserves is in the hands of the Revenue authorities.

Bengal.—Information has not been received regarding the extent or possibility of grazing in ravine and other derelict land outside Government forests.

Bihar.—The main possibility of improving the grazing position in this province lies in the waste areas of the province not under Government control. The possibility of improving grazing conditions in these areas deserves consideration.

Bombay.—Some 2,300 square miles of Reserved and Protected Forests have been handed over to the Revenue Department for management as being primarily more suitable for the production of grass than of timber. In addition there are large areas of land under the Revenue Department not under cultivation but of which a fair percentage is capable of producing grass. Research is required regarding the best use of these lands but their proper management must involve expenditure.

Burma.—Owing to the sparseness of the population this province need not be considered in regard to this question.

Central Provinces and Berar.—The possibilities of grazing outside Government forests in Berar are limited but in the Central Provinces large areas are available. There is no general demand for improvement of the village grazing grounds and progress in this direction is likely to be difficult.

Madras.—There are some 3,330 square miles of forest under Panchayat management and some 9 lakhs of cattle graze in these giving an incidence of double that in the forests under the Forest Department. The Panchayat Forests are under the Revenue Authorities.

North-West Frontier Province.—The position in this province has not been separately reported.

Orissa.—Damage is occurring from grazing in undemarcated forests not under the control of the Forest Department. In some places soil deteriorations and erosion is a serious problem.

Punjab.—It is understood that the Punjab Government is taking active steps to improve conditions in the outer hills of the Himalayas and that in Moshinpur villages have applied for extensive closures to prevent erosion; the closures give good supplies of fodder grass.

Sind.—There is said to be no grazing problem in Sind.

United Provinces.—The bulk of the cattle in the United Provinces do not graze in reserved forests. There are some 42 millions of animals which are provided for outside our forests and the area of waste grazing lands amounts to only 13,000 square miles. Much work has been done and much learnt in regard to the possible uses of waste lands for tree and grass growth. Experiments cover had usar, where continued protection is increasing the yield and improving the quality of the grass obtained, ravine lands along rivers, where mere protection checks erosion and results in good crops of grass, canal banks which provide the easiest conditions and give the best results both in tree and fodder growth and other types of land where experimental work has not yet given clear results. Government has already set an example and results obtainable can be seen by all who are interested. Propaganda amongst landowners, encouragement and advice seem more desirable now than any further expensive demonstrations.

ANNEXURE I.

NOTE ON THE UTILIZATION OF FOREST AREAS IN ASSAM FOR GRAZING.

The areas available for grazing consist of (a) village grazing grounds, (b) Notified grazing areas outside forest reserves and (c) areas in forest reserves open to grazing.

The Forest Department has control over grazing only as regards (c). The control of all grazing in other areas rests with the Revenue Departments.

In so far as grazing in Reserved Forests is concerned, the question is not acute. The following figures taken from Form No. 17 for 1934-35 show the number of buffaloes and cattle grazed in reserved forest on payment of fee :—

	Buffaloes.	Cows and bullocks.
Nongong Division	1,570	1,079
Sibsagar Division	2,212	414
Goalpara Division	4,078	3,840
All other Divisions	635	1,267
	9,304	6,600

The majority of these animals belong to professional graziers, usually Napaalis, and in that they provide a source from which villagers renew their stock of plough cattle, they are of importance.

The main areas, in which forest reserve grazing is available are (i) low lying grass areas often of considerable size in the plains evergreen reserves of Sibsaagar, (ii) the grass lands with scattered Simul on the banks of the Brahmaputra in Sibsaagar, Nongong and Goalpara, (iii) the grass areas on the fringes of the Sal forests in Goalpara.

Although the number of these professional graziers appears to be increasing, it cannot be said that there is a shortage of suitable grazing areas at present.

2. In areas outside reserved forest, i.e., Unclassed State Forests there exist a number of Notified grazing areas, where some 60,000 buffaloes and 60,000 other cattle are grazed. These are also mainly the property of professional graziers.

The term 'notified areas' means an area of grazing land which has been notified by the Deputy Commissioners in the *Assam Gazette* as an area where the procedure of enumeration and the incidence of grazing fees shall be determined with the assistance of the Agricultural Department.

The revised rules for these areas dated the 25th September 1934, provide among other measures of control, for punitive taxation of uncastrated surplus bulls. Selected breeding bulls are allowed free grazing, castrated males are assessed at six annas per head per annum and uncastrated males (other than breeding bulls) at one rupee per head per annum.

In actual practice control is limited by inadequacy of staff and little can be done to limit the number grazed per acre. It is probable that in the majority of cases there is no deterioration of the quality of the grazing at present as the areas available are sufficient for the number of cattle grazed. The notification of such grazing areas is, I believe, increasing.

As regards village grazing grounds, these are merely areas not fit for or not leased for cultivation and are utilized by the village herds, mainly consisting of useless animals which are allowed to breed without restriction.

3. The only other item, which may be of interest is an area of 50 square miles in the Monas Forest Reserve of the Goalpara Division, selected in 1931 with a view to encouraging cattle breeding on approved lines by Forest villagers.

With the advice and help of the Livestock Section of the Agricultural Department, steps have been taken to castrate poor bulls to provide good breeding bulls and to limit the numbers and the proportion of buffaloes to other cattle.

Here again the question of deterioration of fodder grasses has not arisen.

The results of the introduction of measures to ensure so far as possible that stock is raised only from approved bulls have been marked and there is no doubt that the type of animals has improved.

C. E. SIMMONS,

Offg. Conservator of Forests, Assam.

ANNEXURE II.

REPORT ON THE FOREST GRAZING AREAS AND THE POSSIBILITIES FOR GRAZING OF RAVINE AND DERELICT LAND OUTSIDE GOVERNMENT FORESTS IN BIHAR.

1. The problem which will be before the Animal Husbandry Wing will presumably be the problem as it presents itself throughout the province of Bihar and not that only which presents itself in the case of Government owned lands. Before saying anything therefore about the problem in its relation to forests under the management of the Forest Department or in relation to ravine and other derelict land at the disposal of Government, i.e., Government owned, I wish to stress the fact by comparative area figures that by far the greatest part of the problem lies in lands which are not owned by Government and which cannot be brought under Government control or possibly any control except by special steps. If therefore real benefit to Animal Husbandry in Bihar as a whole is to be vouchsafed by the recommendations of these meetings, the meeting of the Animal Husbandry Wing must consider the special steps which the Government should be advised to take before it becomes too late to ensure the maximum benefit to the province as a whole. The problems are acutest in areas where Government have no control and where any recommendations on methods of management of *Forest Grazing Areas* and utilizing waste ravine land would be entirely inapplicable until the Government were prepared to take the necessary steps to bring those areas under their control.

In the province the total areas of land owned by Government is 2,220,534 acres and that owned by other owners is 40,506,437 acres.

2. The area owned by private owners is divisible into roughly three main classes, viz., (a) true cultivated land and such land as is and always will be good for that purpose; (b) waste ravine areas which have been destroyed by bad treatment in the past and which are now practically useless and of practically no value for even grazing; and (c) forest areas in all conditions of density and age into which an ever increasing human and animal population is eating its way and destroying recklessly for temporary cultivation, for grazing and for taking forest produce for their own use and where the human element is concerned for sale whether by right or by theft. There are no true grass lands of any great extent in Bihar. The inevitable fate of such areas is utter barrenness with the eventual complete removal of any chances of applying the recommendations of the representative meeting of forest officers unless they are brought under Government control.

3. The primary problem in such areas therefore is how to bring them under Government control so that proper management may be exercised. Government have the power under the Indian Forest Act in Chapter V but the application of the Act might result in Government having to find large sums of money if owners demanded outright acquisition of their lands as they have a right to do under the Act in preference if they prefer it to management on a share basis. Even if Government had to find such money however it would pay the province in the long run to obtain such complete control and one way in which it would pay would be that of providing for the fodder requirements of the future. This Government is anxious in this respect and recommendations by the Animal Husbandry Wing of the Board of Agriculture would strengthen their cause considerably. Viewed from the broad provincial standpoint this is a far more important consideration for the Wing in connection with this province than that of improving the grazing in the petty areas of Government owned forest where the problem is not really acute as Dr. Blascheck has shown in his note.

4. Leaving the more important part of the problem I have now to consider in a way the less important problem of that in Government owned lands. As Dr. Blascheck has said the problem in Bihar is not great, Government own so little of the land and the forests are in fact largely tree forests. Nevertheless a grazing problem does exist even if it be only in connection with the damage which uncontrolled grazing does and with the means which can and should be devised to overcome it without unreasonably placing difficulties in the way. As I have said there are no true grass lands of any extensive area in Bihar, roughly the province falls on or near the 50 inches rainfall mark which as Dr. Blascheck has shown may be taken as the dividing line between areas which will gradually progress to an ecologically higher type of plant community and those which will not. As Dr. Blascheck has shown, as grazing is a factor which influences the natural progression and is not harmful if controlled it follows that control is essential if the progression is not to be destroyed. The control which is required depends on the systems of management but generally speaking in true forest areas control from the point of

view of the welfare of the tree growth is mostly needed for 5 to 10 years in those areas which are being regenerated and could be effected by grass cutting or rotational grazing. Where forests are surrounded by villages, great damage is always done along the edges of the forests but this is more a matter of protection than control. Elsewhere in the older tree forest areas, control is generally speaking not needed in the interest of the forest so much as in the interest of the cattle and of improving the quality of the grazing and control in such areas could suitably be by rotational grazing.

5. As in the case of privately owned lands, Government lands are divisible into three main classes, viz., (1) cultivated and settled land; (2) ravine and waste lands and (3) tree forest lands. No steps are possible in class (1). Class (3) is divisible into (a) tree forest land which Government have already brought under reservation or protection under the Indian Forest Act and (b) areas which have not for one reason or another come under reservation or protection yet. Generally speaking the areas under the last category are small. Steps are still taken from time to time to bring anything possible under reservation and protection and the policy of Government will be to better things gradually. As such areas are brought under proper management they will gradually be brought under the recommendations but little can be done until they are placed under this Department. Class (2) practically does not exist to any great extent in the reserved or protected forests of the province but may be considered to be represented by the more poorly stocked areas therein. They are not important under present consideration but they are definitely important when considered by themselves as isolated waste areas and in association with class (3) (b) above.

For the purpose of examining the two questions in connection with these areas therefore I will deal with them under two heads represented by class (3) (a) and classes (2) and (3) (b) combined as these two classes really form the ravines and waste lands still at the disposal of Government and owned by them.

6. Class (3) (a) includes the reserved and protected forests in the province which are Government property or in which Government have an interest. Mostly of these are under the direct management of the Forest Department and the exact figure of areas can be seen in the Annual Progress Report on Forest Administration in Bihar (and Orissa) of 1935-36. Other areas for various reasons reserved and protected are managed by Collectors of districts and in some cases the owners manage their own forests with or without working plans prepared for them by this department. The areas which are managed by this department consist of reserved and protected forests and in the case of reserves are generally speaking free from rights but in the case of protected forests and private forests under Government are generally right-burdened and often heavily so. None of these areas can truly be classed as *Forest Grazing Areas* for although grazing is permitted and will probably always have to be permitted and could be managed to provide considerable quantities of fodder grass they are not primarily grazing but timber and fuel areas and are managed for that purpose.

7. Up to the present no steps have been taken to improve the grazing in these class (3) forest areas under the control of the department except that which has resulted automatically from the policy of closing coupes under regeneration against grazing for at least 5 to 10 years after fellings have been carried out in coupes. Generally speaking also where forest areas have remained closed due to inaccessibility, improvement has probably resulted. Improvement therefore has not always been to the direct benefit of the cattle except where grazing has occurred against orders and this has not been infrequent. In fact the protection against illicit grazing causes considerable difficulty.

8. The immediate need to manage our forests to provide the best type of grazing for cattle is not very great though it may be said to be greater generally in the more isolated protected forests than in the less accessible reserves and I consider that at any rate in such areas a policy of improving the fodder grasses might eventually repay the case if suitable protection could be afforded. Most of the protected forests, however, are as I have shown burdened with rights and right-holders are difficult to control especially where they surround a forest block on all sides or where they exist on either side of narrow strips of forests. Their rights have to be met first and exist only in those forests and in many cases protective measures to improve grazing would be an expense and often a heavy one without any chance of recovering the expense by sale of surplus fodder. In most cases protection would be impossible without fencing which would be an added expenditure.

in areas which already do not pay their way. The rights exist only in those areas and the possibility of inducing the right holders to permit fencing and for a time to drive their cattle to more distant forests to satisfy their rights in those areas until their own areas improved would be a herculean task. Still I consider that the adoption of the policy would be good provided the cost had not to be borne by the Forest Department as the problem is hardly one of their making.

9. Recent experiments in trenched areas in a protected forest in the village of Cheriapahar may be considered in this connection however and it is more than probable that this Government could by propaganda and by spending money on such works as object lessons prove to villagers that if such works are carried out and their cattle are stalled-fed or grazed rotationally in such areas their cattle can be better cared for. The experiment at Cheriapahar was started two years ago and with the aid of a sensible Manki in whose village the area lies it has been possible to protect the trenched area from grazing and the trenching has undoubtedly improved the soil cover of the area as well as the grasses. As however the trenching has the effect of retarding flow off, the area is rendered more damp and the natural tendency of such areas will eventually be to progress to higher types of plant association and already there are indications of an increased tendency in that direction. The trenches are contour trenches and undoubtedly have improved the quality and quantities of grass available. The villagers recognise this perfectly and see its possibilities. As the area in question is a protected forest for producing timber and firewood there is no harm if the area does eventually go back to tree forest but were this idea to be applied to areas which it was intended to keep as grazing areas periodical felling and possibly burning on a short rotation would probably prove necessary and such treatment might prove advisable in waste areas protected as grazing reserves. Unfortunately no steps were taken to study the effect on grasses and their improvement when the experiment was laid out and all that can be said is that ocularily there is no doubt that this improvement has been great. It might be advisable now that we can expect improvement almost immediately to lay out one or two sample areas and carry out a regular series of botanical surveys to watch the changes which are sure to be caused and try the introduction of grass cutting, rotational grazing and silage, etc.

10. If by some such means public opinion could be educated to appreciate the benefits the problem would be largely solved and the villager would probably take more kindly to cutting grass in such areas and possibly to rotational grazing. The contour trenching is not expensive and in Bamiaburu has caused undoubted progression even in hill areas with invasion of many new and softer grasses in those areas which were previously almost devoid of vegetation. At any rate in Bihar I think that we can look forward with a great deal of confidence to this method as likely to be of some assistance in solving such grazing problems as we may have and I would recommend such provinces as are interested to see what has been accomplished. Unfortunately no statistical data can be given as the possibilities of the experiment have only slowly grown on us from observation in the last three years during which it has been under trial.

11. Passing on to classes (2) and (3) (b) we come up against areas where Government have to declare their policy. In many ways they are because of their more scattered nature through villages far removed from the larger tree forests more important from the point of view of Animal Husbandry than the already reserved and protected areas as they are the last resource in those areas for helping to solve an ever widening problem. Generally speaking there are large areas under these two classes. All under (3) (b) should be reserved whenever feasible and placed under the management of this department and when this has been done our efforts will solve the problem. But in discussing class (2) areas the first question that arises is as to whose charge they should be. I do not think there is any difficulty over taking over and settling the areas as the land generally belongs to Government. If the areas were placed under the management of this department they could be managed but if kept purely as grazing reserves they would need special attention and should I think be formed into separate grazing divisions. Generally speaking, the areas are bad mostly rocky with soil generally completely exposed. Management and control would however soon make a difference and I place a great deal of faith in contour trenching for reclaiming these areas no matter how bad. In the case of such areas under an influential Divisional Forest Officer I have little doubt that with a small expenditure on the work to begin with as an object lesson villagers would themselves soon see the benefits and undertake the trenching free of cost. At least it could be a hope on which the policy could be founded.

12. As far as the provincial question of animal husbandry is concerned the problem of Bihar does not lie in Government reserved and protected forests or areas in their own waste lands only but in the much larger waste area of the province which is not under Government control and should be brought under their control with as little delay as possible if the position is to be saved.

J. S. OWDEN,
Conservator of Forests, Bihar

ANNEXURE III.

NOTE ON THE BETTER UTILIZATION OF FOREST GRAZING IN BOMBAY.

1. As the note is intended only as a brief summary to form the basis of discussion at the conference, detailed statistics for the Bombay Presidency are not submitted. They will be included in the full statement of the problem as it exists in Bombay which will be given in conference.

2. In dealing with the recommendations of the Royal Commission on Agriculture in India, Dr. Blascheck, Inspector General of Forests in 1933 considered that the grazing of inferior animals in forests cannot be discouraged actively until the larger problem of reducing the numbers of surplus cattle has been taken in hand. I cannot concur in this. A start must be made somewhere. Generally speaking cattle are inferior because they are surplus. And one of the principal reasons for their excessive numbers is the fact that the policy of Government as regards forest grazing has in the past provided at least a minimum of feed and at an entirely trivial cost, thus encouraging, rather than discouraging, their maintenance. At present in this Presidency, even at the maximum scale of fees chargeable the payment of one rupee purchases permission to graze an animal for a whole year over no less than 1/3 of the Bombay Presidency, or in round figures 3,000 square miles of forest, apart from large areas of Revenue waste and unoccupied numbers. Of course such latitude is never actually exercised. But it shows the scale upon which the existing rules for the regulation of grazing exhibit the absolute antithesis of control, or discouragement, of grazing by inferior animals. So long as any animal can be kept alive at such small cost there is no encouragement for improvement. Since the forest lands provide a large proportion of the total area not under cultivation, that is to say still available for grazing, reduction of facilities will provide a potent impetus for reduction of surplus and inferior cattle.

3. Turning to the agenda for the conference part I predicates that the objects of management of forest grazing areas should be to provide the best type of grazing possible; and primarily for the best type of cattle. Every one who has made a study of grazing management has repeatedly emphasised the fact that not only is improvement in the quality of grazing impossible, but deterioration is practically inevitable, unless the incidence of utilisation can be controlled. Within reasonable limits the closer the control the greater will be the possibility of improvement. And the poorer the area the greater is the need for strict control. But control means expenditure on staff, on fencing, and on water supplies, which will be largely unremunerative at any rate for a considerable number of years. If the improvement is to be initiated someone must pay for it, either Government from the revenue it receives from this source at present, and devotes to other objects, for the Bombay Presidency in round figures 7 lakhs of rupees a year, or the agriculturists through enhanced fees. A possible compromise might be to make the exercise of the privilege of grazing in Government forests appendant primarily upon land paying revenue to Government: to fix a basic number of units for grazing of essential animals in proportion to each household and each acre of agricultural land occupied by a household: to allow these essential units grazing as at present either free or at the current rates. All animals in excess of this basic figure for which grazing might be required would have to pay on multiples of the standard rate according to their species. Such a procedure would have the dual advantage of making the most undesirable animals, i.e., the surplus ones, pay for the improvements necessary properly to maintain the better, and also of tending actively to encourage the reduction in numbers of the former. The extent to which such a scheme would meet with political opposition or support is another question.

Such a scale might be—

Basic units.

10 live stock units per household.

20 live stock units for 1st acre of agricultural land or less.

20 live stock units for every extra acre.

Rating of units.

Milk cow 3 units
 Plough bullock 4 units
 Bull 8 units
 Buffalo, male or female. 6 units
 Sheep 1 unit
 Goat 2 units.

Multiplication of basic rate for surplus animals.

6 times the basic rate for goats, buffaloes and bulls.
 4 times rate for bullocks and sheep.
 3 times rate for cows.

4. As regards part 2 of the agenda, this suggests consideration of the possibilities of developing the utilisation of ravine and other derelict lands outside Government forests for grazing purposes, to supplement the facilities for grazing provided in Government forests. In this Presidency some 1,500,000 acres of Reserved and Protected forests have been handed over to the Revenue Department for management as being primarily more suitable for the production of grass than of timber. In addition there are large areas of land in charge of the Revenue Department which are not under cultivation but of which a fair percentage is capable of producing grass. The acreage of these latter is not at present available but may be obtained before the conference meets. I would submit that all lands, whether under the control of the Revenue Department or of the Forest Department, not only theoretically but also in practice should be managed in the manner to which they are economically most suited. I would also submit that the fact that certain lands have been placed under the control of the Revenue Department indicates that probably they are naturally of "border-line" status, doubtfully remunerative under cultivation, or under forest crops, but likely to be capable of management as grazing grounds even if of poor quality. Their proper utilisation is therefore not merely a question "supplementary" to the grazing facilities in Government forests but is on the contrary a primary objective. Grazing is only part of the aim of true economic management in forest lands, though often a very important part. For lands in the control of the Revenue Department, other than those required for town planning and so forth, it is generally the only use to which they can be put. But here again management means strict control and control means expenditure. Our experience so far is all too small to enable us to state accurately what will be the cost and what the eventual return direct and indirect. If funds and staff had been available for research in these questions in the past we might have been in a position to present concrete examples of the results obtainable and their cost. As no such figures are available the best policy will be to initiate at once, under the full range of conditions of soils and climates, experimental stations which will serve the dual purpose of research centres and demonstration areas for scientific management of grazing lands.

E. A. GARLAND,

Deputy Conservator of Forests, Bombay.

ANNEXURE IV.

CENTRAL PROVINCES AND BERAR.

*Note on the Better Utilization of Forest Areas for grazing.**Land Revenue System.*

The systems are very different in the Central Provinces and Berar and must be described separately. In Berar the Bombay ryotwari system is the basis of the Land Revenue settlements. Only the actual fields of cultivators are alienated and Government has retained its control of all other land. The main classification of land for our purposes is —

Berar.

	Square miles.
Total area	17,778
A class reserved forests mainly for the production of tree forest managed by the Forest Department	2,400
C class reserved forests mainly for pasture managed by the Forest Department	820
E class un-reserved forests for free pasture under the Revenue Department	606

The A class forests are mostly open to grazing and are freely resorted to for the purpose except when their situation prevents it. The Forest Department imposes closures according to Working Plans. Grazing rates are moderate. Grazing can be fully controlled and limits imposed. Goats and sheep are excluded.

The C class forests are open to unrestricted grazing of all animals, no closures are allowed and no exclusions permitted. Grazing fees are less than in A class. Many are seriously damaged by grazing and little grass or tree growth remains. Rules can be revised by Local Government.

The E class forests are not under the Forest Department and are open to free and unrestricted grazing. They are usually small areas of unculturable land which cannot for various reasons be put into C class. They are mostly in a very bad condition.

So far as Government control is concerned the position is quite easy in Berar. With small exceptions all the grazing land is unalienated and rules can be changed as there are no rights, only privileges.

Central Provinces.—The Central Provinces has had quite a different history and the bulk of the land is alienated by villages (mauzas) to malguzars; there is a fair amount of zamindari land and some ryotwari. In the malguzari land the malguzar has by custom obtained much control over the forest and for practical purposes under existing laws Government has not much power of control in the village grazing grounds. In well developed tracts village grazing grounds are in a bad condition. The ryotwari lands are only important in a few districts and have been invariably carved out of reserved forest, reserved originally as a temporary measure for future consideration. What corresponds, however, to C class reserved forest in Berar, is here protected forest not under the Forest Department. It is being destroyed both as tree forest and as grazing ground but destruction has usually not gone very far. The A class forests of the Central Provinces are what was originally classed as waste land. They may or may not be well distributed in the districts but in most districts only a small proportion of villages are near enough to be able to graze. A large proportion of villages, however, have grazing grounds in the villages, and it is only those quite close to the forests (within three miles) who really do graze in the reserves. The A class forests (with unimportant exceptions) are open to grazing on payment of fees which are usually nominal or small. Closures are regularly made according to Working Plans. On the whole grazing grounds are not in any danger in the reserved forests. The main problem in the Central Provinces are that reserved forest is badly distributed and that under existing laws Government cannot exert much control over grazing grounds in alienated villages.

Central Provinces—

	Square miles.
Total area	80,704
Cultivated area	27,874
Alienated tree forest (Zamindari)	5,350
Alienated grazing grounds	31,670*
Government forest	16,091

*Includes current fallows, culturable waste other than fallow and land not available for cultivation.

Extent of the problem.—It is a general fact usually true but with a few exceptions, that the more grazing facilities, the worse the cattle, and it is invariably true that few good cattle resort to the reserved forests for grazing. The more intelligent section of the community occupy the better land usually far away from the forests and the lands near the forests are poorer in quality and in the hands of aboriginals or other less intelligent castes. The cultivator of the plains keeps no more cattle than he needs, each one is of great importance to him, he cares for them and feeds them fairly well. When he has to replace them he may buy from good breeds if available but more generally from selected cattle brought to annual fairs from the more jungly neighbourhoods. These cattle improve somewhat by more regular feeding. The inhabitants of the jungly areas keep large herds of miserable cattle far larger than they need or the country needs. For practical purposes they never have any stall feeding. When the crops have been reaped they graze in the fields. At other times they graze in the forest or in the village grazing lands, going daily to and from the forest. In the rains, however, a certain number of surplus cattle are sent to cattle camps in the forest and they may come long distances for the purpose. In one or two districts there is some hot weather grazing in cattle camps. For all these grazing purposes in Berar there is really only Government forest available with small exceptions, but in the Central Provinces, there are large areas of private forest besides the reserved.

In trying to get some measure of the problem of improvement of grazing one must realise that in the Central Provinces the ordinary village grazing lands are alienated and the power of Government to enforce any measures is doubtful. My own view is that without public opinion behind it, or a special act, the Local Government would be powerless to enforce any measures whatsoever. At present there is no demand for such measures and the position is an impasse. In the ryotwari areas, quite a small proportion of the Provinces, Government has the power to impose measures, but whether they could be made effective is quite another proposition. The question is not very acute in the ryotwari and the main problem lies in malguzari areas. In Berar Government certainly has the power to enforce measures and they could be enforced in C class forests by the Forest Department. The B class areas are not under the Forest Department and are not staffed in any way. They are also in quite small bits and patches and personally I am doubtful for this reason whether it is worth while taking any steps. In the C class however the matter is quite a practical proposition and the Berari is a fairly intelligent man. The Yeotmal district association has recently approached me about imposing regular closures in C class under certain conditions as a measure of pasture improvement, and the proposals are receiving sympathetic consideration. The C class forests are open to unrestricted grazing by rule only, not by law, so the question is merely one of Local Government revising the rules.

The Agenda—

1. THE EXISTING METHODS OF MANAGING THE FOREST GRAZING AREAS AND THE VIEW TO INSURE THAT THIS PROVIDES THE BEST USE OF GRAZING AND THE BEST USE AS POSSIBLY FOR THE PRESERVATION AND IMPROVEMENT OF THE FOREST STOCK.

The long has long been a subject in the Central Provinces and Berar. The Forest Department has been for some time past engaged in a series of experiments with a view to improving the condition of the forest stock. The results of these experiments have been published in the Forest Department's annual reports. The results have been very satisfactory and it has been decided to extend the system to all the forest grazing areas in the Central Provinces and Berar.

local population and in consultation with the Working Plan Officer to arrange a grazing settlement. He deals with nistar but the bulk of his work, is the grazing settlement. This system has been in force for about twenty-five years and every district has a grazing settlement. The bulk are quite good but a few are out of date and remain for revision.

The circular issued by the Government of India in 1894, embodying the recommendations of Dr. Volcker on the improvement of Indian Agriculture, is the basis of the existing forest policy in the Central Provinces and Berar. The Royal Commission on Agriculture accepted this policy and recommended that the forests should be classified into—

- (i) Major forests for the production of good timber and fuel plantations.
- (ii) Minor forests for pasture.
- (iii) Lands available for cultivation.

The last category does not exist to any appreciable extent but otherwise the recommendation has been carried out fully and each of the two main heads has been further subdivided with following result.

	Square miles.	
I.—Tree Forest—		
(i) Moist type	2,325	
(ii) Dry type	8,622	
		10,947
II.—Scrub Forest—		
(i) Pasture forest	4,914	
(ii) Open pasture	1,422	
		6,336
III.—Other (Forest villages, grass reserves, etc.)	2,285	
Total	10,568	

On the whole this classification has worked well but has presented a few difficulties. The present classification is a preliminary one and will be revised district by district, as a part of the regular duty of working plans officers. The tree forest gave no difficulty as it is usually remote and of no importance to grazing. In the scrub forest, however, the sub-division pasture presents certain difficulties: much of this type is not only important for grazing but also for the supply of local timber and fuel; on occasions it produces the best revenue of a division. On the other hand there are areas of bare dry and rocky hills in remote situations too distant from villages to be of any use for pasture, and yet too poor as forest to come under the main head, I Tree Forest. However these difficulties are not serious.

In the Working Plan the regular working circles are formed out of parts of the forests under the first three subheads. The balance of these and the open pasture form a miscellaneous circle in which grazing is often the principal demand.

The ruling grazing incidences (not inflexible) in the different classes are as follows:—

TREE FOREST Moist type 4 acres per head.

Dry type 3 acres per head but 2 acres in teak forests.

SCRUB FOREST Pasture 1 acre per head.

Open pasture

None.

In general grazing is no problem in the moist forests. Many of the dry type tree forests are subject to grazing demand and care is taken to satisfy this as far as possible. In the pasture forests grazing has to take a more important part in deciding the management. The closure after main working is the minimum silviculturally required but further closures, later in the rotation, are prescribed with the sole object of improving the value of the forest as grazing ground and for no other purpose. The cutting of grass for fodder is to be encouraged by low rates. The open pastures are not regularly worked but are subject to regular closures: for

three years at a time, not more than 25 per cent. being closed at any one time. Cutting of grass is to be encouraged as in the pasture forest, and advantage is to be taken of the closure periods to carry out fellings in such tree forest as exists with the sole object of improving the pasture.

Based on this classification of the forests the whole area is divided into grazing units, each consisting of a group of compartments. Where grazing demand is heavy the size of the units is small, usually a few thousand acres but sometimes only a few hundred. Where grazing demand is little the units are huge up to a whole range or more. The grazing demand on each unit is then examined in detail. Lists of villages are made which habitually graze or wish to graze in a particular unit. Where exclusions have to be made methods have varied in the past, but are now definitely fixed. In the appendix is given a history of the grazing in the Nagpur-Wardha forest division, drawn up by Mr. K. P. Sagreya, and the current methods of making exclusions are described there.

The Agenda II—

THE POSSIBILITIES OF DEVELOPING THE UTILIZATION OF RAVINE AND DERELICT LAND OUTSIDE GOVERNMENT FORESTS FOR GRAZING PURPOSES IN ORDER TO SUPPLEMENT THE FACILITIES FOR GRAZING PROVIDED IN GOVERNMENT FORESTS AND TO MAKE RECOMMENDATIONS.

This matter is put rather the wrong way round for the Central Provinces where most grazing takes place in village grazing grounds, which are supplemented by Government forest. The main obstacles to any improvement of village grazing grounds are that there is no general demand for any action to be taken, lack of interest by absentee landlords and the lack of power with Government under present laws to enforce action.

It is a fact that under present conditions nothing will be done for the good of the general public unless Government gives a lead, as there is a woeful lack of public spirit among landowners, and they rarely do anything for the good of their tenants. Further, whatever schemes may be drawn up, it will be essential for success that means of enforcing them are provided.

The easiest way to improve grazing grounds is by rotational closure to grazing; to prevent grazing during the rains and immediately afterwards until the grass seed has fallen. An act should be passed permitting Government to frame rules, enforceable under the act, for the preservation and improvement of grazing grounds in such malguzari villages as may from time to time be notified in the gazette. It would be desirable to make offences compoundable and to make the malguzar responsible for the cost of enforcement. The rules would prescribe that certain areas of the grazing grounds of a village will be divided into, say, five roughly equal parts by some simple boundaries. Each such part will be closed to grazing in rotation for three (or four, or five) years. It might not be necessary to keep the closed area closed all the year round, and it could be opened for dry weather grazing at any time after the grass has seeded. The malguzar would provide the chowkidar. He would also be allowed the revenue from grasscutting, with the idea that from it he would pay the chowkidar. The duty of the chowkidar would be to prevent grazing, to impound cattle straying into the closed area, possibly to issue passes for cutting grass (which could include monthly tickets) and certainly to check the export of grass. To make a success of the proposal either the malguzar himself or some other local person of good standing must take a personal interest in it. It is thus essential that first efforts should be made in carefully selected villages where the hope of success is considerable. It would be better if Government servants of the subordinate grades have no official hand in the matter, but there is no objection to their showing public spirit and taking a fatherly interest in the work. Once a few demonstration villages have got started, malguzars, village associations and the general public should be encouraged to apply for the notification of their villages under the rules, and it is certain that if the first few villages are properly treated, others will quickly follow.

There will be less difficulty in Berar. The Scheme can be extended in principle to the E class areas merely by altering existing rules under the Land Revenue Act. It is very important also to extend operations to the C class forest, and this is even simpler as it merely means altering the rules under the forest act. In the E class the main difficulty will be the means of enforcement.

C. M. HARLOW,

Conservator of Forests, Western Circle, C. P.

APPENDIX.

HISTORY OF REGULATION OF GRAZING IN THE NAGPUR-WARDHA DIVISION.

Prior to reservation, there were no restrictions, and the forests were heavily grazed by the cattle, goats and sheep belonging to villages and to the nomadic tribes which kept large herds for transport of grain and for sale of plough bullocks, meat, goat skins and wool. Naturally grazing was confined to the most accessible forests. Shortly after reservation the grazing of goats and sheep was stopped in them, but no restrictions were imposed on the grazing of cattle. Very soon, however, it was found that the uncontrolled grazing of cattle only was causing much harm to the forest and extensive areas were entirely closed to grazing. The extension of cultivation that followed stabilised government led to a diminution of private grazing grounds and consequently to a much heavier pressure on the reserved forests open to grazing. It was also observed that continuous closures were unfavourable to reproduction—especially of teak. The working plan of 1895, therefore, prescribed that coupes should be closed only for 10 or 15 years after the main fellings, and should then remain open to unlimited grazing for the rest of the rotation. These prescriptions remained in force till 1912, and it was found that this resulted in a distinct improvement of the forest and the pasture. But the method of regulating the grazing was far from being ideal. Its main defects were that under it large stretches of forests became "out of bounds" for cattle and thus much local hardship was caused. The long period of continuous grazing was also found not altogether satisfactory. The working plan was revised in 1912. Under the new plan grazing was regulated by a special detailed scheme which was the first of its kind in the province and has served as a model in subsequent years. The prescriptions of this scheme may briefly be summarised as under :—

The forests, comprising an area of 714 square miles, were classified according to their utility into the grazing, mixed, and teak working circles. In the mixed and teak working circles a minimum incidence of 3 acres per head of cattle was allowed, and rotational closures were prescribed as under :—

Teak Working Circle.—Three closures of 5 years each with intervals of 5 years between successive closures. Felling cycle 45 years, i.e., $1/3$ closure.

Mixed Working Circle.—One closure of 15 years after main fellings. Felling cycle 30 years, i.e., $1/2$ closure.

In the grazing working circle the incidence was 1.5 acres per head of cattle, and no closures were imposed. Some small isolated blocks were set aside as grass reserves. The grazing requirements of the neighbouring villages were then examined and a list was drawn up of all villages which were to be permitted to graze in the government forests. It was found that the number of cattle owned by the agriculturists was usually much in excess of the number really necessary for agriculture, and also that it was much greater than the number that could be admitted in the government forest under the proposed limitations. It was therefore necessary to restrict the number of cattle admitted from each village and for this purpose three classes of cattle were distinguished.

(a) privileged, i.e., cattle absolutely indispensable for *bona fide* agricultural pursuits a limit of 4 per working plough was fixed which is liberal.

(b) ordinary i.e., cattle reasonably necessary for quasi-agricultural pursuits such as the supply of milk, manure, and breeding for domestic use; 4 per plough over and above the privileged cattle were considered adequate, and is also liberal.

(c) Commercial, i.e., remaining cattle which were kept mostly for trade in cattle and milk products.

For each class of cattle, grazing rates were fixed. The first was a nominal rate of two or three annas, the second was a light rate of eight or ten annas and the third was a heavy rate of one rupee per head of cattle, all per annum. Preference was given to privileged and ordinary cattle commercial cattle being admitted only if the prescribed incidence had not been exceeded.

This scheme was an advance on previous arrangements but later experience showed that there was still much room for improvement, and it was modified from time to time as follows :—

(i) In certain units the total number of cattle in the listed villages exceeded the total number permitted to graze. The first applicants were given licenses for their cattle up to the specified limit for the unit, a system liable to malpractices by the

subordinate staff. To regulate the issue of licenses, the number of cattle that each agriculturist could graze was therefore laid down, and a limit was fixed for each village by the divisional officer.

(ii) In consequence of the decrease and deterioration of private grazing grounds and of the unreasonable grazing rates charged by the proprietors, the demand for grazing in the Government forest gradually increased. To meet this demand restrictions were relaxed in 1923 as under:—

A. The total area available for grazing was increased—

- (a) by reducing the closures in the mixed forest (rotation 30 years) from one half to one-third, and in the teak forest (rotation 45 years) from one third to two ninths, viz., a single closure of ten years after the main felling; and
- (b) by throwing open to grazing at commercial rates, areas unworked owing to lack of demand, upto an incidence of 3 acres per head of cattle.

B. The total number of cattle admitted into the forest was increased—

- (a) by discontinuing the rationing of the privileged cattle. Hereafter all privileged cattle of listed villages were to be admitted; and
- (b) by permitting unlimited grazing in the grazing working circle.

These relaxations were soon found to be undesirable and a revision of the settlement became imminent for the following among other reasons—

- (i) the number of cattle admitted fell far short of the demand;
- (ii) the closure of extensive areas of forest in certain localities was causing much local hardship;
- (iii) the practice of closing areas for ten years and opening them for a continuous stretch of 20 or 35 years caused temporary improvement only to the tree growth and the pasture;
- (iv) the continuous and unlimited grazing in the grazing working circle was gradually reducing the yield of fodder; and
- (v) certain units were very large and made up of scattered blocks in which grazing conditions were not uniform, with the result the local incidence was excessive in many areas.

The revised working plan has been introduced from 1st July 1935. The new classification of the forests ordered by the Government in 1935, has been the basis of prescription. Grazing is a most important problem in this division and consequently an elaborate grazing settlement accompanies the plan.

Present grazing settlement.

The reclassification of forests, in accordance with the 1935 orders of the Government compares with the previous classification as under:—

Class of forest.	Percentage of total forest.	
	Before 1935.	After 1935.
Tree forest	82.3 { Moist type Dry type	0.0 41.1
Scrub forest	12.7 { Pasture forest open pasture	13.5 16.9
Grass reserves	2.0	2.1
Forest villages	3.0	3.4
	100.0	100.0

In order to distribute the pressure of grazing uniformly the forests have been divided into 109 grazing units as against only 34 in the previous plan, as under :—

Class of forest.	Area in acres.	No. of grazing units.
Tree forest (Dry type)	2,10,608	23
Pasture forest	1,44,254	20
Open pasture	77,208	27
Grass reserves	9,355	13
Forest villages	15,370	26
	4,56,885	109

Grazing in the various units is regulated as follows :—

- (i) Improvement working circle (tree forest). Felling cycle 24 years. The maximum incidence permitted is 3 acres per head of cattle. Coupes will be closed to grazing for 8 years after main fellings. The working circle is lightly grazed and the closures are unlikely to cause any hardship.
- (ii) Conversion working circle (tree forest). Felling cycle 72 years. Maximum incidence permitted 2 acres per head of cattle. Coupes will be closed for 6 years after main fellings and also after the two intermediate fellings.
- (iii) Coppice with reserves working circle (tree forest and scrub forest). Maximum incidence permitted 3 acres in mixed forests and 2 acres in teak forest. Rotational closures are prescribed as under.—
Teak forests.—Rotation 48 years.—Coupes will be closed to grazing while they are theoretically 1—4, 17—20 and 33—36 years old. 1/4 closure.
Mixed forests.—Rotation 48 years.—Coupes will be closed to grazing while they are theoretically 1—6 and 25—30 years old. 1/4 closure.
- (iv) Open pasture working circle.
 Maximum incidence permitted 0.5 acres per head of cattle Felling cycle 16 years and areas will be closed to grazing for 4 years after working, i.e., 1/4 closure.
- (v) Miscellaneous working circle (grass reserves and forest villages). Grass reserves will be permanently closed to grazing, and forest villages are open to grazing for the forest village cattle only.

In all Felling Series care has been taken to arrange the closure of the coupes in such a manner that no hardship will be caused to cattle owners, ample area being open to grazing at all periods of the rotation, close to every village listed to the unit.

Under these prescriptions provision has been made for nearly 3 lacs of cattle as against only one lac in the previous grazing settlement. Most of the villages that desired grazing in the forest have been accommodated. There has, however, been no increase in the grazing revenue, as most of the cattle that were formerly grazing at commercial rates being unlisted, can now avail themselves of grazing at privileged rates. Reports show that the settlement is working satisfactorily.

K. P. SAGREIYA,
Silviculturist, O. P.

ANNEXURE V.

NOTE ON FOREST GRAZING IN MADRAS.

In the Madras Presidency reserved forests are divided into two classes (*viz.*)—

- (i) Timber, fuel and sandalwood forests and forests to be protected for climatic reasons. These are under the control of the Forest Department. Grazing in these forests is subsidiary to the main object for which they are maintained.
- (ii) Local or ryots forests. Generally these are situated close to villages and have been allotted mainly for grazing. These are managed by Forest Panchayats under the control of the Revenue Department.

System of grazing.—Grazing in class I forests is allowed on permits issued by the Department on payment of the prescribed fees. Formerly the grazing areas in each division were divided into blocks and permits were issued only to graze in the particular blocks. In 1926 the grazing permits were made valid for a whole forest range, and in 1932 they were made valid for the Range and to the whole division on payment of the fee prescribed for that Range and to the whole division on payment of the highest fee prevailing in it.

Areas requiring special protection, such as areas under regeneration and felled coupes are closed to grazing for a certain number of years. Burnt areas are also closed to grazing for one or two years to enable them to recover from the effects of the fires. The area of departmental forests closed to grazing works out to 12 per cent. of the total area in the Presidency.

The average incidence of grazing in the departmental forests is 5.32 acres. But this incidence is not very evenly distributed. It is heavy for some distance inside reserve boundaries and around pens and light in the less accessible regions. Under the existing system it is not possible to enforce the limitation of cattle to the possibility, nor to give preference to superior cattle, nor to close the grazing areas to grazing for a sufficient period after the rains to allow the grass to grow. An unlimited number of cattle are sent to the forests to get whatever grazing they can get. The result is that the inferior cattle multiply at the expense of the superior cattle and the forests are overgrazed.

Grazing fees.—The grazing fees vary widely in the different divisions and even in different ranges in the same division. Goat browsing is prohibited in reserves. Generally buffaloes are charged twice the fee for a cow and a cow is charged twice the fee for a sheep. The fees range from 3 annas to one rupee per cow unit for a whole year. The average for the whole presidency may be roughly stated to be 3 annas per cow unit. The fees charged are admittedly low and far below the actual value of the grazing. It is the cheapness of forest grazing that encourages the ryots to send large numbers of inferior cattle to the forests. In 1933 Government were addressed for a general enhancement of the grazing fees in the Presidency. They, however, deferred consideration of the proposal on the ground of the prevailing agricultural depression and directed the Chief Conservator to renew the proposal when conditions improved. The agricultural depression has not lifted since then.

Introduction of better strains of grasses.—In recent years two kinds of superior grass, (*viz.*), Kikuyu and Kolukkattai—have been tried in several divisions on an experimental scale with varying degrees of success according to the soil and timely rain. The introduction of these grasses on an extensive scale will not be a paying proposition unless it becomes possible to charge special grazing fees for specially treated areas with adequate water facilities for the cattle.

Improvement of grazing grounds.—Grazing grounds have been cleared of prickly pear by the Cochineal insect. Penning is allowed wherever necessary. In divisions of light rain-fall the water supply in grazing grounds has been improved as far as funds could be found for the purpose.

Grass cutting.—In most of the divisions the ryots are allowed to cut and remove grass on headloads free of charge. This concession is availed of according to the local demand for fodder. In 1935-36 it was availed of to a large extent in several divisions.

Rotational grazing.—This has been started experimentally in limited areas in two divisions and Government were requested to approve its introduction in a few selected areas in a third division. They have deferred their approval for a year within which time they want the scheme to be popularized by propaganda. A

system of grazing known as the kancha system, which prevails in the Nellore division which specialises in producing superior bulls and cows requires special mention. Under this system the grazing areas are divided into grazing blocks, which are leased out at so much per acre. The kanchadar, (i.e., the lessee) is bound by the terms of his agreement to protect the area, close it to grazing for three months commencing with the monsoon, and to limit the admission of cattle to the possibility. This system, which is a time-honoured one, has worked satisfactorily so far as the owners of superior cattle are concerned and has largely contributed to the preservation of the fine breed of cattle for which this district is famous. But the owners of inferior cattle, whose only object is to get cheap grazing, have been agitating for the replacement of the kancha system by the ordinary permit system. On a recent representation received from these men Government have suggested the retention of the system and its management by the department as a possible solution. As the suggestion entails additional expenditure and presents practical difficulties it is proposed to recommend the retention of the present system of leasing the kanchas. Nellore is the only division in the Presidency in which grazing is managed on sound principles under the kancha system. It would be a step in the right direction if this system could be introduced into other districts.

T. A. WHITEHEAD,

Ag. Chief Conservator of Forests, Madras.

ANNEXURE VI.

NOTE ON THE PRESENT GRAZING SITUATION IN THE FORESTS OF ORISSA.

Dr. Blascheck divided forest grazing grounds into two areas separated by a 50" rainfall limit and the Orissa forests are all classed as true forests with no grass land. This is hardly correct. Many of the Orissa forests are not dense tree forest. They shade off into the Central Provinces type. Further over most of the forests large perennial grasses are rare. Grassy glades due to past cultivation, etc., frequently occur and owing to the short rainy season and frequent fires these tend to remain as grass-lands. It would be true however to state that in hardly any of our reserved forests would the improvement of pasture be regarded as the main object of management.

2. The position with regard to incidence of grazing is as follows. Only in the Ganjam and Sambalpur District forests is there much demand for grazing in reserves. In Sambalpur the maximum incidence is fixed at 4 acres per bullock and 6 acres per buffalo after excluding rocky tracts. There is no serious damage from grazing although tree regeneration is checked in heavily grazed tracts along boundaries. In Ganjam the incidence of grazing is not controlled but it is believed to be fairly light. In Demarcated Protected Forests the grazing incidence is fixed at the above figures in Angul District but not in Puri District where it is too heavy. In all districts grazing is not allowed in areas under regeneration. In one block in Sambalpur Division closure to grazing by monthly rotation is now being tried. We have no knowledge as to what degree of closure or incidence of grazing is required from the point of view of protection of soil and improvement of pastures.

3. So far as the Department is concerned we need to control the incidence of grazing more carefully in Protected Forest blocks on which there is a heavy demand and rotational closure should be experimented with further. Most damage from grazing occurs however in undemarcated protected forests not under our control. In some of these forests soil deterioration and erosion is a serious problem. The soil and pastures of such forests could in many cases be greatly improved by contour ridging but it is doubtful whether the Forest Department will be called upon to take action.

J. W. NICHOLSON,
Offg. Conservator of Forests, Orissa.

ANNEXURE VII.

NOTE ON THE PRESENT GRAZING SITUATION IN THE FORESTS OF THE N.-W. F. P.

The remarks concerning the position in the Punjab apply equally to the conditions in Galis Division.

2. In Kagan Division the grazing areas may be classified as :—

- (i) Chair forests.
- (ii) Chir Guzaras.
- (iii) Deodar and Blue Pine forests.
- (iv) Fir forests.
- (v) Deodar. Blue Pine and Fir Guzaras.
- (vi) Alpine grazing grounds above the forest line.

Conditions prevailing in these classes are :—

- (i) *Chir forests*.—The incidence in these areas is very light and the villagers use them for grazing in the early spring and in the autumn.
- (ii) *Chir guzaras*.—There are some guzaras where the combined effect of over grazing and fires have reduced the quality of grazing considerably. This is chiefly due to insufficient guzara areas. The bigger guzaras suffer no deterioration, but sound pasture management is needed and rotational closures will be of great benefit.
- (iii) *Deodar and Blue Pine forests*.—This class does not suffer from over grazing even in areas under rights because there are extensive guzaras in the same zone and class (vi) areas are preferred during the summer.
- (iv) *Fir forests*.—This class adjoins class (vi) at the upper limit and is deteriorating in the higher parts from over grazing in the summer months. The birch belt, which is the natural feature of the upper limit of fir forests, has disappeared in the Kagan Valley from excessive grazing and lopping. In the fir forest proper, there is not much grass owing to the dense shade.
- (v) *Deodar, Blue Pine and Fir guzaras*.—Conditions of class (ii) apply to this class also. The quality of grazing is better in this class but rotational closures in the smaller guzaras would improve the grass.
- (vi) *Alpine grazing grounds above the forest line*.—This class contains the most highly prized grazing grounds in Hazara and covers the greater portion of the upper half of the Kagan Valley. These areas are outside Government Forest and are in the private ownership of the Svels of Kagan who realize grazing fees. Buffaloes, kine, sheep and goats are allowed to graze. The quality of grazing is, however, deteriorating. Overgrazing on southern slopes has helped *Artemisia maritima* to take possession of large areas in place of grass, and on many grassy slopes very extensive patches of elderberry are forming which require eradication to improve and extend the grazing.

Rotational closures will improve the grazing very considerably.

G. D. KITCHINGMAN,

Offg. Conservator of Forests, N.-W. F. P.

ANNEXURE VIII.

GENERAL NOTE ON BETTER UTILIZATION OF GRAZING AREAS IN THE UNITED PROVINCES.

1. The Government of India letter No. F-31-4/36-F., dated September 3, 1936, divides the subject into two parts, which will conveniently be considered separately, i.e., (A) *Forest grazing areas*, and (B) *Other waste lands outside Government forests*.

2. There is one point common to *all* grazing, and connected with animal husbandry and improvement of farm animals which requires consideration. The Government of India letter hints that grazing should be reserved "as far as possible for the preservation and improvement of the *best type of cattle*". What is the best type of cattle for the main objectives for which vast herds of cattle are kept in the United Provinces? What are the main objectives consider, for example, cattle in the hills. These are *not* kept primarily :—

- (a) for beef (the population is predominantly Hindu).
- (b) for transport (there are very few cart roads).

They are kept to a limited extent for :—

- (c) milk and dairy produce (supplementing buffaloes and goats).
- (d) ploughing, and for this, large animals would be useless on the small terraced fields.

An important objective is undoubtedly :—

- (e) manure, there being *no alternative* (except forest litter in parts).

Again in the Plains districts, large herds of underfed cattle are kept largely for manure and fuel (cowdung cakes), there being again *no alternative* within the reach of the average cultivator. Can the Agricultural Department definitely say what are the best types of cattle for production of manure? Can they even say that fewer well fed pedigree cattle will produce more manure than large herds of miserable cattle? I propose to raise these questions at the Madras Conference, as they evidently have an important bearing on the points under discussion, and have to be answered before any drastic restrictions on grazing can be justified. In my opinion, if the U. P. Government prohibited or limited long standing grazing rights and concessions in forest areas, or charged prohibitive fees, in areas where production of manure is an important object, the economic condition of the people would definitely suffer by the resulting reduction of manure. The average cultivator cannot buy chemical fertilisers, as the Hydro-electric Department of the United Provinces are this year buying in large quantities for some cultivators.

3. (A) *Forest Grazing*.—(i) *Statistics*.—These are given in the attached table I for the U. P. forests.

(ii) *Extent of problem*.—By way of comparison, table II shows the comparatively small number of domestic animals that graze in the forests compared with the vast numbers in the province as a whole. Dr. Blaschek's views given in 1933 are not entirely applicable to the U. P., as most of the early forest settlements definitely limited the numbers of animals which could graze in a definite forest area, by fixing a maximum number for each right-holding village. In most forest settlements also, the Forest Department was given the power to close a certain proportion of the total area for purposes of reproduction. The total area of forest (including Tarai and Rhabar Estates) is roughly 6,000 square miles, of which 2,000 square miles of 33 per cent. is closed to grazing, and 4,000 square miles (including most of the Himalayan forests) or 67 per cent. is open to grazing. There is not, I think, a single Division in the Province of which it would be true to say, in the words Dr. Blaschek used in 1933 that the matter "has now grown into an intolerable burden of over-grazing, which ruins any chance of improving the forests silviculturally". It is an established fact that practically all our forests are on the whole steadily improving silviculturally (except certain sal forests affected by drought).

(iii) *Classification of grass lands and grazing lands*.—Dr. Blaschek based his classification entirely on rainfall and records two main types, "which are separated roughly by the 50 per cent. of rainfall mark", above 50" being poor grazing grounds and below 50" being good. This statement, and in fact this basis for classification, gives a false impression of U. P. conditions. Ideal grazing grounds and indifferent grazing areas exist side by side, as for example the Ganges Khadir and Kholn, the

Tarai and the Bhabar, the moist low level forests of Bahraich and the dry high level damars. In fact, the classification between good and bad grazing areas depends far more on *drainage* than on total rainfall. The following extract from my note to Government of July last explains the classification adopted in the United Provinces.

"In considering the grazing problem in the United Provinces, and the scope for co-operation between the Forest Department and other Departments (notably Revenue and Agriculture), it is important to realise that there are two quite distinct types of grazing areas :

A. *Natural grazing areas*.—These include low-lying savannahs, not subject to denudation or erosion with the water level near the surface, where the grass remains green winter and summer (as well as the rains), as for example the Ganges Khadar, the sub-montane Tarai, the grassy charors and low-level alluvial (miscellaneous) forests of Haldwani, Kheri, Bahraich, etc. In these natural grazing grounds, there is *no limit* to the amount of grazing that can be accommodated, in fact the more these areas are grazed the better, since the growth of coarse grasses is thereby checked. Obviously where unlimited grazing is welcomed, improvement in grazing facilities is not a question of co-operation between various classes of officers.

B. *Unnatural grazing areas*.—These include all the other waste lands in the Province, where the water level is usually low and the grass dries up in the winter and hot weather. They are frequently elevated and subject to erosion, and intensive grazing tends to eliminate the edible fodder grasses. Examples of such areas are :—

- (a) the Ganges Khola, the revine tracts of the Jumna and Chambal, the Siwaliks of Saharanpur the dry submontane Bhabar zone, the high level plateaux (with sal forests) of Kheri, Bahraich, Gonda,
- (b) the Himalayan tracts of Kumaun Circle, and Chakrata, and finally,
- (c) Usar plains.

In such types it has been proved time and again that improved grazing can only be obtained by strictly limiting the incidence of grazing".

(iv) *Findings of the Royal Commission on Agriculture in India*.—Here again Dr. Blascheck's views require modification for U. P. conditions. He made the usual assumption that there are large herds of *surplus* cattle which should be reduced. But so long as the hard-worked cultivated land is undermanured, can there be any surplus cattle in the absence of other fertilisers? The total head of cattle in the United Provinces works out at rather less than one head per acre of cultivated land, and that one head has to supply not only manure but to a large extent fuel also. Is there an excessive head or stock? The fact that less than 4 per cent. of the total cultivated area is under fodder crops probably indicates why cattle generally are underfed in the United Provinces.

Again Dr. Blascheck did not mention the fact that for decades all the forests in the United Provinces have been under Working Plans, most of which have timber working circles, and grazing (or miscellaneous) Working circles, and hence the classification of forest areas for the growth of timber and for grazing has already largely been completed years ago. Nor is grazing (under regulation) in the timber area incompatible with silviculture, and our forests generally are not "deteriorating rapidly through overgrazing".

To complete this note, I attach a summary of the position in the United Provinces in note A.

4. (B) *Other waste lands outside Government forests*.—The statistics given in table II attached indicate very clearly how far more important from the provincial point of view is this branch of the enquiry. The total area of waste lands (in the plains districts) totals over 13,000 square miles or more than double the area of Government forests. Even more impressive is the fact that out of a grand total of 43 million domestic animals in the Province, 42 millions never go near the forests, and for them the forests might not exist! The relative importance of this subject justifies a fairly detailed summary, which is attached in note B.

E. A. SMYTHIES.

Conservator of Forests, Western Circle, U. P.

NOTE A.

Summary of conditions in the Government forest areas in the United Provinces.

1. The management and improvement of forest grazing, has long been recognised as one of the most important of forest problems in India. It has been a subject for discussion and debate at several big Silvicultural Conferences held at Dehra Dun, and the Fourth Conference of 1934 adopted the following resolution :—

“This Conference considers the development of investigations for the improvement of forest grazing a matter of the utmost importance and therefore recommends that the experiments started in several provinces since 1922 should form the subject of an all-India investigation. In the co-ordination and developments of these experiments the assistance and collaboration of the Agricultural Department should be invited, particularly with regard to a systematic ecological study of the grasses and their nutritive value.

This Conference also considers that the reduction of the herds of inferior cattle and the encouragements of stall feeding and the control of grazing are the only final solution of the grazing problem in India”.

2. In my general note, I have already given information on the following points :—

- (a) Statistics.
- (b) The importance of production of cowdung and manure.
- (c) Classification of natural and indifferent grazing areas.
- (d) The grazing problem in the U. P. forests generally is under adequate control, and grazing (as controlled) is not incompatible with sound silviculture and management of tree growth.
- (e) The allotment of forest areas (i) primarily for timber and (ii) primarily for grazing, is completed, but the two frequently overlap without raising insuperable problems of management.

3 There are certain other points to which I must refer in some detail.

The political aspect of discouraging grazing.—Approximately 68 per cent. of the total number of animals that graze in Government forests are free, under rights granted at forest settlements or long standing concessions. Any attempt to curtail these would lead immediately to powerful political agitation (as we experienced after the Kumaon Settlement of 1914-19), and no popular Government could attempt it without the strongest and most convincing justification. And in point of fact, there is no convincing justification. From the forest point of view, generally speaking, the future of the forests is not threatened and the forests continue to improve. In the future of the forests, controlled grazing tends to reduce the inflammability and out pine and sal forests, while past experience suggests that the first result of political unrest is an outbreak of incendiarism, which does infinitely more harm to the forest than grazing can ever do. From the general administration point of view, any curtailment of grazing, particularly in the hills, must curtail the supply of essential manure for the cultivation, and hence cause deterioration in the welfare of the cultivators. The U. P. Government would be opposed to any resolution curtailing the rights and concessions to free forest grazing in the United Provinces. (These amount in value to about 4½ lakhs per annum.)

As regards grazing on payment, the rates vary for commercial grazing in different parts and for different animals, from one anna per sheep or goat (in Kumaon) up to Rs. 4 per buffalo (in western Circle) per annum. The Forest Department receive about Rs. 2 lakhs per annum revenue from this source, and the necessity to curtail it does not arise.

4. *Improvement of grazing areas.*—The natural grazing areas, i.e., the low lying savannahs, require no improvement, as they improve with grazing, and no limitations of grazing have ever been enforced or required. In the dry and inferior type of grazing areas, it is a mistake to think only in terms of grass. One of the most important developments in the Forest Department in recent years has been the realisation that fodder supplies in dry tracts can often be greatly improved and increased by making plantations of fodder trees. It is obvious that a fodder tree, which stands annual or periodical lopping produces a much greater quantity of leaf fodder than the grass that would be produced on the ground it occupies. The Forest Department

is very actively following the policy of creating extensive plantations at negligible cost by means of taungya, for the improvement of fodder supplies, as well as improvement of timber and firewood. I would instance the Saharanpur division, where over 2,000 acres of successful plantations have already been started and where we aim to take up 600 acres per annum for the next 50 years. Also the Bhinga forests of Balraha, where over 20,000 acres have been set aside for taungya plantations, and to improve *inter alia* the facilities for grazing and leaf fodder for the surrounding villages. Our taungya villages in Saharanpur have already a population of over 2,000 and we have started village schools, medical attendance, co-operative societies, etc. These facts will indicate how important we regard the organisation for creating successful fodder and fuel plantations. We have no hesitation in thinking that this line of approach holds out greater promise than any possibilities of improving the grass; as these dry areas are by nature intended for tree crops rather than for grass production, and the production of leaf fodder in three dimensional space must obviously be far greater than any possible production of fodder grass in two dimensional space. Our plantations are not yet old enough to stand lopping (the oldest are only 5 years old), but we propose in due course to have controlled rotational lopping of leaf fodder, and details will be worked out as we gain experience.

5 *Lopping for leaf fodder in existing forests.*—This habit is widespread and forms an important addition to grazing in the feeding of livestock. Experience has proved conclusively that control of lopping is essential. For example, the *gujars*—notoriously destructive loppers—lop widely in the forests of the Western Circle, but under control and no lasting damage to the forests results. On the other hand, the uncontrolled lopping of oak forests in Kumaon has been so destructive since these forests were removed from the control of the Forest Department 12 years ago, that the local people have become thoroughly alarmed, and have in many areas (i) petitioned for the Forest Department to come back again, (ii) started panchayat forests to enforce their own control and conserve available supplies. This affords a striking testimony for the necessity of control in lopping.

These are the principal points for note concerning grazing and fodder supplies in the Government forest areas.

E. A. SMYTHIES,
Conservator of Forests, Western Circle, U. P.

NOTE B

Summary of conditions in the waste lands outside the Government forests in the United Provinces.

1. Table II, which has been briefly referred to in my general note, gives striking statistics of grazing incidence in the United Provinces. The 1935 cattle census report points out that "there is roughly one quarter of an acre of grazing land for every animal in the province". If, however, we exclude the hills, the Government forests, and the animals that graze therein, we find roughly 13,000 square miles of grazing (waste) lands and 42 million animals, or 5 animals per acre! This preposterous total is probably at least 10 times what an acre of average grazing land can support in a state of semi-starvation, (this is rather a guess, as I have no data of accurate measurements or results). However, it is evident that in the plains districts of the United Provinces the domestic animals depend for their existence very largely on stall feeding and on fodder crops (2,000 square miles), bhusa, rice stalks, fallow lands, etc., rather than on grazing grounds, which should therefore be regarded as incidental rather than the main source of food.

2. That is no reason, however, why the best should not be made of these grazing grounds. It will be noted that they are more than double the total area under the Forest Department (or 2½ times that area if we exclude the Kumaon hills). I have been unable to ascertain how much of these 13,000 square miles are moist natural grazing grounds (including the khadir of the main rivers, and the margins of jhils) and how much are of the dry and indifferent type of grazing grounds (including usar, ravines, bhur, etc.), but I think undoubtedly the latter are considerably more than half the total, and hence probably exceed the total area under the Forest Department. As in the comparable forest areas, the former requires little or no control, the latter are, however, undoubtedly capable of great improvement.

3. Since the issue of Sir Jon Hewett's famous resolution on Afforestation in 1912, and the creation of the Afforestation branch of the Forest Department, we have during these 24 years gained a considerable amount of experience in these various types of waste lands, as well as on canal banks (of the Ganges canals system), the poorer types of culturable soil, etc., as regards production of trees growth and incidentally of improvement of fodder. It will be useful here to record briefly the results obtained on each of the main types separately.

(1) *Usar* (or alkali plains). These are useless for tree growth, but are capable of considerable improvement in the production of fodder and grasses. Thus a very interesting experiment in merely closing a *bad* bare usar area (near Lucknow) to grazing and substituting grass cutting has resulted in a steady and remarkable increase of yield of grasses per acre every year for the past 4 years since the experiment started. The actual yields per acre have been

1931	2.7 maunds	} An increase of nearly 500 per cent. in 4 years. (Further data for 1936 will be available shortly.)
1932	4.8 "	
1933	9.3 "	
1934	12.1 "	

In some of our usar areas, e.g., near Unao and Cawnpore which have been protected from grazing for a long time yields of over 20 maunds of hay per acre are attained. As the aggregate area of usar (unfit for cultivation) in the United Provinces is enormous, these experiments suggest that the supply of fodder can be greatly increased wherever it proves feasible to substitute grass cutting for grazing.

(ii) *Ravine lands*.—These reach their maximum development in the Jumna-Chambal tract, but ravines also occur near all the rivers (in the plains districts) with elevated banks. Our experience suggests that mild ravines without kankar pans, (e.g., Allan Bagh Lucknow Improvement Trust, etc.), are quite suitable for both tree growth and fodder production; that ravines with underlying kankar pans are useless for tree growth, but even in the fierce ravine tracts of Etawah and Agra, mere protection from grazing and substitution of grass cutting, with no other reclamation work at all, will check erosion and greatly increase fodder production per acre.

(iii) *Bhur*.—(Sand hills and sandy land unfit for cultivation). Experiments have been too limited and on too small a scale to give convincing results, but there are indications that successful tree plantations with certain riverain species (notably *Dalbergia sisso* and *Acacia catechu*) is possible in the absence of excessive frost and drought, with some improvement in fodder and edible grasses.

(iv) *Canal banks*.—For the production of timber, fuel, and fodder, these have proved unequalled, and the canal plantations show a rate of growth that cannot be surpassed by any forest areas in the Province.

(v) *Poor agricultural land*, (i.e., just culturable but precarious). This type has proved eminently suitable for the creation of flourishing plantations for the production of a small timber (poles), fuel, leaf fodder, and fodder grass. Zamindars employ some of the best culturable lands for mango baghs and fruit trees, if they could be induced to employ some of the worst of their culturable lands for produce which is just as valuable in the economic life of the community, there would, I believe, be a corresponding improvement in rural conditions. Not only would the increase of fodder result in increase of manure, but also the resulting fuel would release or divert a corresponding amount of manure from being burnt as fuel to fertilising the fields. Such plantations can be created at very small cost on poor agricultural land by *taungya* methods (compare the Sharanpur *taungyas* in a waterless and bouldery tract), but might require remissions of rent and land revenue while they were being created.

4 The above remarks indicate the possibilities of improvement in the waste lands and poorer agricultural soils of the Province. If any adequate action, commensurate with the possible scope, is to materialise, the best action for Government may be suggested. Twenty-four years ago, the mistake was made of depending almost exclusively on direct Government action. I believe that propaganda, encouragement and free expert advice would be more useful and cost much less. For a start, the appointment on special duty for a few months of a Gazetted Forest Officer, with an intimate knowledge of rural conditions and requirements, *taungya* methods, and results of past experiments, to tour the plains districts and explore the possibilities, interview the large land owners, get in touch with the Agricultural, Co-operative, Rural Development Departments of Government, and submit a report, would not involve Government in any great expense or liabilities, but would provide valuable information in judging possibilities and for forming a policy for the future.

E. A. SMYTHIES,

Conservator of Forests, Western Circle, U. P.

1st October 1936.

TABLE I.

Statistics of grazing in State Forests of the U. P.

	Number of animals on payment.				Number of animals free.				Grand total all animals.	Area open to grazing square miles.	Average incidence per square mile.
	Buffaloes.	Cows and bullocks.	Sheep and goats.	Other Animals.	Total all animals.	Buffaloes.	Cows and bullocks.	Sheep and goats.	Other Animals.		
Forest Department.	50,000	173,000	124,000	4,000	357,000	48,000	500,000	100,000	1,000	1,021,000	3,200
Trial Bhair Estates.	9,000	20,000	10,000	1,000	40,000	33,000	175,000	10,000	4,000	208,000	800
Total	59,000	193,000	134,000	5,000	403,000	81,000	675,000	110,000	5,000	1,289,000	322

The value of grass and grazing given free or at concession rates from the U. P. forests amounts to Rs. 4 lakhs per annum.

TABLE II.

Statistics of total domestic animals in the U. P. and grazing areas.

	Buffaloes.	Cows and bullocks.	Sheep and goats.	Other animals.	Total all animals.	Total grazing area in square miles.	Average incidence per square mile.
Animals that graze in forests * 1	140,000	883,000	250,000	10,000	1,283,000	4,000*1	322 or 1 per 2 acres.
Total animals in the U. P. vide 1935 cattle census * 2.	9,203,000	23,177,000	10,002,000	818,000	43,300,000	18,300*2	2,305 or 3.7 per acre.

(The total area of cultivated land in the U. P. = 54,000 square miles, i.e., 60 per cent. of the total area of the Province 2.)

* 1. Includes 118 million animals and 1,200 square miles in Garhwal and Almora districts.

* 2. Excludes Garhwal and Almora districts, and the States of Benares, Rampur, and Tehri Garhwal, but includes other forest tracts.

APPENDIX XXX (c).

NOTE ON SUBJECT No. 54, by DR. R. MACLAGAN GORRIE, D.Sc., I.F.S.

Conservation of Hill Grazings.

A most valuable summary of the grazing situation for the country as a whole has been contributed by Mr. Ware, and it is proposed to restrict this paper to the needs of the sloping lands and foothills. The semi-arid foothills of the Western Himalayas and the dry low hills of peninsular India carry a tremendously heavy human and livestock population chiefly because livestock thrives best in areas of light rainfall. Unfortunately because of this light rainfall the natural vegetation is much more vulnerable and more easily destroyed than the vegetation which is associated with a heavier rainfall. The more arid the climate the more easily is the ecological balance upset. The drier areas therefore form a particularly difficult problem in so far as rapid and destructive erosion follows automatically upon any decrease in the efficiency of the natural plant cover whose role of protecting the soil is interfered with very seriously by constant overgrazing. Not only is the soil exposed to serious washing but the natural soil-building processes which go on under a cover of jungle or grass are interfered with and the soil profile is destroyed instead of being built up. Probably the worst effect of such changes is the decrease in the porosity of the soil, which is no longer capable of absorbing and passing down to the sub-soil layers the large percentage of rainfall which ought to feed the underground springs and reservoirs. The deterioration of sloping grazing lands thus leads directly to cumulative desiccation through the exaggeration of sudden floods. The rainfall from such lands becomes more and more of a menace by forming sudden flood peaks followed by almost equally sudden drying up of the whole country-side. For areas such as the Punjab, the N.-W. F. P., Bihar, Orissa, and in fact all plains areas dependent upon higher lands for their water supplies, the conservation of hill grazings is thus of very vital importance to the community as a whole.

The value of properly clothed grazings for water conservation is well brought out by recent measurements of soil porosity in the Boise water catchment area in Idaho. These show a close relation between the rate of absorption of water by the soil and the presence and character of the plant cover. The area is arid hill grazing land with less than 30 inches of rainfall, mostly of sudden summer storms similar to our western Punjab monsoon and with a very open cover of tufted bushes and isolated clumps of grass. Percolation was 71 per cent. more effective for all plant-bearing plots than for bare ones, but was $2\frac{1}{2}$ times more effective for fibrous-rooted species than for tap-rooted species. Now the best grazing plants are mostly of the fibrous rooted type (e.g., *dub* and most other good pasture grasses, clover and other herbaceous or subshrub legumes) so that good pasture management to conserve and increase such plants will at the same time give better water conservation. This study showed that the extra percolation was due to the fact that the water followed the root channels downwards, resulting in an increased penetration in the immediate vicinity of all roots. A multitude of the fibrous roots gives a more general penetration than the few coarse roots of the tap-rooted class. These figures are taken from the September 1936 number of the *American Journal of Forestry*.

The responsibility for hill grazings is commonly thought to rest with the provincial forest departments, and in certain areas the forest department does control a fairly large share of the foothills. As the climate becomes more arid conservation becomes more difficult, however, and it is in just such places that control is poorest. The Royal Commission of Agriculture has asked for a reclassification of forest areas for grazing, but a large part of the Punjab forests are actually grazing grounds already too fully utilised for grazing. Only 9 per cent. of the 5,200 square miles under the control of the Punjab Forest Department is closed to grazing. If we include the seriously eroding foothills of Kashmir and some other States, there are some 35,000 sq. miles of sloping ground all suffering more or less seriously from erosion in a strip about 60 miles broad between the Jumna and Chenab, widening to 120 miles broad between Jhelum and Indus. Within this, the area actually controlled by the provincial forest department forms barely a twelfth, the balance of the forest charges miles of the Punjab foothills over which the forest department has no control and no other department of Government has so far attempted any form of soil conservation work.

The plain fact of the matter is that no department of Government is responsible for controlling the proper utilisation of the land as a whole. The early forest settlements were all framed by civil officials with the main object of enabling the zemindar to pay his land revenue, and practically every long-term interest was sacrificed in order to insure this payment. It was nobody's responsibility to see that the land itself, whether grazed or cultivated, was being used in a reasonable manner which would ensure its permanent productivity. Today the situation is much worse. The revenue department is anxious to collect its revenue, the forest department to grow trees, the agriculture department to grow better paying crops, the veterinary department to grow more sheep, the local land owner to keep a stud bull, the irrigation department to find more canal water, the public health authorities to improve the drinking water. They are all competing for the foothills which should be the natural fodder reserves of the province but which are rapidly becoming a national menace through misuse and erosion, while to check it is not within the power of any one department of Government. Out of the various land uses, grazing has undoubtedly received least attention because, except in so far as it interferes with the regeneration of forest trees, it has been more or less neglected by everybody. There are of course some outstanding exceptions to this rather sweeping generalisation *e.g.*, the effective conservation of grasslands built up over many years by the forest department in the Central Provinces and the more recent grassland closures in the Punjab which I shall presently describe in more detail.

Forest conservation has undoubtedly checked erosion most effectively wherever the department has been authorised to grow trees, because the forest settlements have actually provided for effective control of grazing in areas allocated to timber and fuel production in order to ensure regeneration of the forest crop. Thus in Kangra and the Murree Hills we have many areas closed for regeneration which demonstrate clearly what excellent fodder crops can be produced merely by closure to grazing for a very few years. Only in two districts of the Punjab, namely, Hoshiarpur and Gurgaon, has the forest department been able to undertake extensive closures of land with the primary object of producing a grass crop; in Hoshiarpur this has been done under the Chos Act which is purely a counter-erosion measure limited to the Siwalik foothills of Hoshiarpur and Ambala districts; the closures originally enforced under the Act in 1905 have been such an effective object lesson in improving the area that a further 55,000 acres of closures have been obtained recently by Mr. A. P. F. Hamilton through publicity and persuasion. In Gurgaon some 8,000 acres closures have been obtained by offering a remission of revenue on a system introduced by Mr. F. I. Brayne when he was there as Deputy Commissioner, the closures thus obtained being administered by the forest department.

Mr. Ware has enumerated 10 items of work which call for early attention in dealing with the grazing problem. I am sure that everyone with a knowledge of animal husbandry requirements will approve of his list, but I should like to add a word about the relative urgency of these various items, the priority of which may vary considerably as between provinces and even as between neighbouring districts, according to economic pressure, past attempts at organisation, and many other factors.

In the Punjab the outstanding need is for an immediate and very drastic reduction in the total of grazing animals. The grazing incidence for the whole provincial forest area is 1.2 acres per animal but even this indication of heavy stocking gives no accurate picture of the real state of affairs. The whole of the foothills of the outer Himalayas, the Siwaliks, the Salt Range and many other smaller ranges of low hills, are literally crawling with livestock of every description. The east of the province gets enough rainfall to allow of fairly rapid recovery, but the west is becoming more arid as the ground cover becomes less efficient for catching and storing the already inadequate rainfall. Both through fresh legal powers and through a widely organised series of practical demonstration areas a really drastic reduction of live stock must be aimed at, beginning with the destruction of useless scrub bulls and bullocks and the complete exclusion of goat browsing. Other ways of obtaining an early reduction of stock are as follows:—

- (1) division of common grazing grounds amongst individual shareholders. This has been conspicuously successful in parts of Jhelum district where land hunger has forced the pace of improvement of individual holdings so that in villages with the least area of common grazing ground there is a marked reduction in the number of useless and half-starved beasts.

- (2) any form of rotational grazing closures, restriction of permits, fencing, grass cutting or fodder conservation in any form which will tend to impress upon cattle owners the need for reducing flocks and herds to make the available fodder supply go

further. In Hamirpur, for instance, the forest regeneration closures have provided such a good supply of cut grass that the zemindars are beginning to appreciate the value of stall-fed animals.

(3) the castration of scrub bulls is already practised in several districts, but unless combined with other restrictions is not in itself sufficient to have any immediate effect upon the appallingly heavy overstocking.

Having secured a definite reduction in the number of livestock, we should then be free to go ahead with the remaining items of work enumerated by Mr. Ware, namely erosion control, a better water supply for the animals, soil and plant surveys, feeding trials and introduction of new fodder plants. But I wish to emphasise the urgent need for the reduction of numbers. By sheer weight of numbers our grazing grounds are rapidly being reduced to dust heaps just at the time when increased interest in human nutrition is rightly emphasising the all-important role of milk as a food.

Incidentally, I think, two warnings would not be out of place. First, it is easy to salve one's conscience by glibly expecting the botanist to save the situation by introducing some exotic blessed with the food value of lucern and the invasive qualities of *Lantana* or prickly pear. I do not wish to decry the value of plant introductions, or of future possibilities in this line, but it would be merely shutting our eyes to the seriousness of the present situation were we to depend upon the botanists to get us out of the hole we have landed ourselves in through several decades of gross misuse of land. In this connection I would call your attention to the grazing problem in arid South Australia which is surprisingly akin to our Indian one. After giving detailed consideration to the possibilities of improvement by the introduction of exotics, the Australian authority F. N. Ratcliffe concludes that little can be expected in this way where the rainfall lies below 10 inches per annum, while above that amount the possibility serves merely to divert attention from the more urgent need of reducing the number of livestock.

There is nevertheless a great field for constructive improvement of fodder production by means of closure and cultivation of the more valuable local species and exotics of known fodder value. The possibilities of such work have been clearly demonstrated by R. G. Stapledon at Aberystwyth and by several of the American research stations such as Mandan, North Dakota. In certain districts of the Punjab such as Kangra similar work should be comparatively easy but the details must be worked out for each area and it would be dangerous to generalise too freely as to either the methods or the possible results. Some form of Watt bandi or contour ridging would appear to be the best means of improving the absorptive capacity and the plant cover of our gently sloping lands, though for any slope over a 1 in 4 it would be unsafe to reopen it for grazing as the ridging once broken would merely exaggerate the erosion.

My second warning is lest we should expect salvation through the work of the animal breeder. As long as the fodder supply is insufficient for the needs of the existing hardy animals which are more or less immune to the effects of drought and fodder shortage, the introduction of superior strains of animals is likely to be positive danger. This has been the actual experience in both East and West Africa where the introduction of exotic cattle for breeding was followed by severe losses amongst the half-bred progeny which could not compete with the scrub animals. The first adequate fodder supply. The same remark applies to sheep rearing which is now very popular amongst certain civil and veterinary officers; in a country already overrun with half-starved mobs of goats and sheep, milk and plough cattle, buffaloes, camels, donkeys and mules there does not appear to be much justification for introducing Merino and other well bred rams, though after proper conservation of the fodder and a reduction of useless beasts had been secured, such an introduction would be of undoubted value.

Summary.—To co-ordinate the efforts of those interested in this problem I would suggest that the local committees recommended by the Royal Commission on Agriculture should deal not only with reclassification according to grazing values. They should be given executive powers for the subsequent enforcement of grazing control and erosion control measures. There is no doubt whatever that the permanent productivity of the foothills for fodder, grazing and water supplies can only be guaranteed if the number of animals is reduced and a constructive policy of erosion control is adopted. Either, without the other is more or less a waste of time and money, because neither by itself will effect more than a temporary check in the present rapid denudation of all sloping lands. Such committees would also be able to correlate the activities of the different land-operating departments where these overlap or oppose each other.

APPENDIX XXX (d).

REPORT OF THE PRELIMINARY CONFERENCE ON THE BETTER UTILIZATION OF FOREST AREAS FOR GRAZING.

Terms of reference.

- (i) To examine the existing methods of management of forest grazing areas with a view to ensure that they provide the best type of grazing and are used as far as possible for the preservation and improvement of the best type of cattle; and
- (ii) The possibilities of developing the utilization of ravine and other derelict land outside Government forests for grazing purposes in order to supplement the facilities for grazing provided in Government forests, and to make recommendations.

Report—Part I.

The preliminary conference convened for the consideration of item 34 of the Agenda—The Better Utilization of Forest Areas for Grazing—has had placed before it full reports from all Provinces and Presidencies. These reports have included detailed statistics of incidences of grazing on forest land, percentages of the total cattle and livestock populations which utilize forest grazing, and percentages of forest land to total areas. These figures, though of the greatest interest, cover so wide a variety of conditions that it is not possible to compress them into a brief report. Selected figures also might give a false impression of the position as a whole. It has therefore been decided to deal with the subject on broad general lines for India as a whole.

2. Grasses resemble trees in constituting crops with a wide diversity of utility. But, considering their value as a cheap source of fodder it seems that grasses have been strangely neglected in the past, both as regards detailed scientific research into their individual nutritive properties and as regards investigations into the best methods of their treatment as crops. The layman is apt to consider all grasses as producing grazing, just in the same way as he tends to assume that all trees produce timber: in each case a uniform commodity provided by nature with no, or only trivial, assistance from man. All Forest Officers, as producers of timber, realize the deplorable fallacy in such ideas. Also as managers of land, Forest Officers have a considerable interest in the occurrence and utilization of grasses, though usually only as a side line to their main business. The natural occurrence of grasses as well as of trees is governed by a combination of the factors of topography, climate and soil. And in India, generally speaking, the grasses take an important place in the vegetation under conditions which normally inhibit the production of the best timber.

3. A rough, but convenient, general classification of the vegetation in areas which come under the management of the Forest department in India distinguishes four main types.

- (a) The coniferous forests of the Himalayas.
- (b) All other timber forests.
- (c) Poor pole, scrub or thorn forests.
- (d) True pastures.

Class (a) includes at lower levels the chir pine forests (*Pinus longifolia*). Here the undergrowth is typically grass which provides grazing of indifferent quality. Closures for reproduction of the pine crop are the only closures made. Over the rest of the area in the Punjab and Kumaon Himalaya unrestricted grazing under rights or concessions is permitted. Early burning is carried out for fire protection and nothing more can be done to improve the grazing. At higher elevations the forests consist typically of *deodar* (*Cedrus deodara*) and the firs beneath which the forest floor is usually bare of all plants suitable for grazing other than a few weeds during the rains.

4. In class (b) are placed other forests yielding timber, as visualised in Resolution No. 22-F. of 19th October 1894. It includes the great *sal* (*Shorea robusta*) belt of the foot-hills and parts of the Central Provinces, Orissa and Chota Nagpur, the better quality teak (*Tectona grandis*) forests of the Central Provinces, Bombay and Madras, and the tropical evergreen forests of southern and western India. In these areas grazing is usually of little value and where carried out under rights, is generally harmful. In the miscellaneous forests included in *sal* divisions, grazing

is carried on under the prescriptions of the local forest working plans. These plans take into account all privileges and rights acknowledged under the Revenue settlements in force in the districts concerned. They are invariably scrutinized by the Revenue authorities before being sanctioned by Government. Subject to careful avoidance of any interference with the acknowledged rights and privileges, closures to grazing are usually applied solely with reference to the avoidance of physical injury to young tree crops after exploitation of mature timber. Owing to the fact that climatic conditions which are suitable for the growth of timber forests are seldom such that fodder grasses can take any place in the climatic climax vegetation, the grazing available is usually of the coarsest quality and in little demand.

5. *Class (c).—Poor coppice, scrub or thorn forest* covers the great bulk of the remainder of the lands controlled by the Forest department. In some provinces this class also extends over large acreages of private lands or lands classified as "cultivable waste" under the Revenue department. In other provinces in accordance with the policy of the Government of India, which was introduced in their Resolution No. 17 A-105 of 15th July 1891 calling for tripartite classification of all land into :

- (1) Cultivation,
- (2) Pastures and Fodder Reserves,
- (3) Forests properly so called.

Much land was formally notified as Reserved Forest simply for administrative convenience in order that it might be brought under some organized management. The objective was specifically stated in the Resolution not necessarily to be the production of trees, and the agency for management was not necessarily to be the Forest department. It was also clearly laid down that pastures meant grazing grounds which were to be brought under a definite system of management. Such land is usually in areas of light rainfall and carries a crop consisting principally of grasses and shrubs, interspersed more or less profusely with poor pole, scrub or thorn forest in accordance with local increase or decrease of soil moisture. A considerable percentage of it might therefore be designated as wooded pasture. Unfortunately, because of the light rainfall, this type of natural vegetation is highly vulnerable to ill-treatment and much more easily destroyed than vegetation with a heavier rainfall. It was therefore in greatest need of careful management. But the history of these lands has almost always been that, until recent years, not only have they received the least scientific management: they have also frequently been, in all senses of the phrase, a "no-man's land." In the Bombay Presidency in 1898 and again in 1910 large areas in the Deccan, totalling roughly 1,500,000 acres, were removed from the control of the Forest department and placed under the Revenue department who have neither the staff, the time, nor in the majority of cases the technical knowledge, to regulate the grazing utilization in any way. In the Madras Presidency in 1924 some 3,400, square miles of lands formerly managed by the Forest department were transferred to control by village panchayats. In its latest review of the working of these forest panchayats in Madras Presidency the Board of Revenue has remarked that, "Most of the Collectors report that the ordinary revenue staff has not been able to devote the requisite attention to the panchayats with the result that many of them are left to take care of themselves. The forests have in consequence deteriorated to some extent."

6. In areas in this class (c) which are still under organized management by the Forest department grazing is regulated by the prescriptions of the local Forest Working Plans, and in the past these prescriptions were usually similar to those for timber forests. In recent years however, as these plans have come up for revision, the grass crops have received increasing consideration in conjunction with the tree crops, since the former frequently represent an important part of the climax vegetation under the climatic conditions in which these pole, scrub and thorn forests occur. In the Central Provinces every Working Plan includes an elaborate grazing settlement. When the Working Plan is completed as far as silviculture is concerned and approved by the Chief Conservator of Forests, Government appoints a Special Revenue Officer to examine and report on its effect on the local population, and a most important part of his work is the grazing settlement. This is put up in skeleton by the Working Plan Officer and he and the Special Revenue Officer work out the details on tour together. The forests are divided up into grazing units, which are geographical areas, fixed on the demand for grazing. Where demand is heavy units may be

small, usually a few thousand acres, but perhaps as small as a few hundred. Where demand is light, units are large and may be several hundred square miles. Each unit is then examined in detail. The average area open to grazing is calculated by deducting the average area closed from the total area. From the incidence for the type which varies from 1 to 3 acres per head, the number of cattle admissible is then calculated. This is compared with demand as obtained from past figures and by enquiry direct from the villages concerned. When exclusions are necessary, cattle from villages at a distance or which graze only occasionally are first excluded; sometimes transfers can be made to other units almost as convenient but this requires careful arrangement. If the demand is still in excess of the number admissible exclusions are made by classes. Plough cattle up to four per plough are admitted first, under the head of privileged cattle. After that ordinary cattle (or milch cattle) are admitted up to four per plough. After that additional and commercial cattle can be admitted up to the limit. As an example in some units of Nimar division, four privileged cattle and two ordinary cattle are admitted per plough. Each unit is described and defined in the Working Plan and if grazing demand is fairly heavy the villages allowed to graze are listed to the unit. Such a system for the control and management of grazing areas is to be highly commended. In one division in the Madras Presidency (*viz.*, Nellore), an ancient system known as the Kancha kancha system the grazing area is divided into convenient blocks which are leased. The lessee (the kanchadar) issues permits to the ryots at rates ranging from 4 annas to Rs. 1-8-0. He is bound by the terms of his agreement to protect the block, to close it to grazing for three months commencing with the monsoon, and to limit the admission of cattle to the possibility. This system has largely contributed to the preservation of the fine breed of cattle for which this division is famous. Elsewhere in India grazing in this type of forest is free by right and without any restriction in number, with the result that not only have the forests been ruined both for the production of wood and grass, but erosion has become a major problem.

In the United Provinces, in Bundelkhand and Ajmer, a special point is made of closure to grazing during the four monsoon months and slow and steady improvement is reported as compared with neighbouring village waste which is open to uncontrolled grazing throughout the year. The Forest Working Plans for Saharanpur, Gonda and Banda divisions, prescribe up to two square miles of new plantations to be made annually in which a mixture of timber species (chiefly *Dalbergia sissoo*, *Acacia catechu* and *Bombax malabaricum*) are raised with a varying proportion of fodder species for lopping (*e.g.*, *Terminalias*, *Bauhinias*, *Kydia calycina*, etc.). These plantations are made in lines between temporary cultivation of field crops and after the cultivation is abandoned the subsequent grass crop is generally decidedly better than that formerly occupying the ground. Useless bushes and shrubs have also been eradicated by the cultivation.

In Bombay Presidency special rotations for the improvement of the grass crops have been introduced in East Khandesh district for all the areas of this class under the management of the Forest department. Each compact area is divided into convenient blocks and each block is subdivided into five compartments each of which receives the same treatment on a five-year cycle. This treatment is as follows:—

Year.	Graze.	Close.
1	15th June to 31st August, 2½ months.	....
• . . . .	....	1st September to 14th June, 9½ months.
•	1st November to 14th June, 7½ months.	15th June to 31st October, 4½ months.
•
•	1st September to 14th June, 9½ months.	15th June to 31st August, 2½ months.
•	15th June to 11th June, 12 months.	....
•	15th June to 11th June, 12 months.	....

This sequence results in grazing being available in the following compartments of each block during each year of the cycle:—

Year.	15th June to 31st August.	1st September to 14th June.	1st November to 14th June.
1	1, 2, 3	2, 3, 4	2, 3, 4, 5
2	2, 3, 4	3, 4, 5	3, 4, 5, 1
3	3, 4, 5	4, 5, 1	4, 5, 1, 2
4	4, 5, 1	5, 1, 2	5, 1, 2, 3
5	5, 1, 2	1, 2, 3	1, 2, 3, 4

This cycle is superimposed on a 30-year felling cycle for coppice poles and fuel. The system has been in force for 5 years and has resulted in definite improvement in the quality and quantity of the grasses. A similar system with some slight modifications has now been proposed for introduction in the whole of the adjoining district of West Khandesh.

In the Punjab the Forest department is powerless to introduce improvements owing to the fact that unrestricted free grazing has been given as a right. The foot-hills have in consequence been denuded of their vegetation and the consequent erosion of these tertiary rocks is appalling. The question of the ameliorative treatment of areas outside the control of the Forest department is dealt with under Part II of our terms of reference. All that need be said here is that generally the high hopes as to the future of areas handed over for management by panchayats, advisory boards, and similar bodies do not appear to have been realized. Grasses emphatically form a very specialized type of crop and just as for trees or field crops expert knowledge and skilled management are essential.

7. The last class of land class (d) consists of true grazing grounds where grass and not trees is the climax vegetation. So far as the Forest department sphere of control is concerned these are limited to the Alpine pastures and the considerable areas in the Terai in the United Provinces and Assam. In neither case are any special steps considered to be necessary at present for the improvement of the grass stock. In the Terai grazing improves the quality of the herbage which otherwise is excessively coarse. The Alpine pastures are too remote for any control to be feasible.

8. Figures put before us make very clear the fact that the grazing which can be made available in lands in charge of the Forest department can exert only an almost trivial influence upon the vast problem of the improvement of India's livestock as a whole. Representatives from the United Provinces, Madras, Punjab, Central Provinces and Bombay have been present at this preliminary conference and the following summary taken from official figures gives the numbers of livestock which at present utilize forest grazing and their incidence per acre. For comparison with the above are given the total livestock populations in each of the above provinces and for the whole of India. These figures have been further analysed so as to show the proportion of livestock which obtain grazing in forest lands, and their incidence per square mile. For comparison with the above the incidence is given of all the remaining cattle in each province on lands which may be considered as possibly available for grazing outside forest lands. These include all lands which are classified either as not available for cultivation, or as cultivable waste excluding fallow.

Forest Grazing lands.

Provinces.	Total area of forest lands in square miles.	Area open to grazing in square miles.	Numbers of Livestock in thousands utilizing forest grazing.				Numbers per square mile of open area and acreage available per head.
			Buffaloes.	Cows and bullocks.	Sheep and goats.	Others.	
United provinces	6,000	4,000	148	883	250	10	322
Madras	16,000	14,000	108	1,370	732	..	15
Punjab	5,200	4,700	247	866	1,557	56	580
Central Provinces	19,400	17,000	312	2,500	300	5	183
Bombay	14,000	12,400	353	1,514	542	17	105
Total	60,600	52,100	1,166	7,133	3,381	88	226
							Acres.
							2
							4
							1.1
							3.5
							3.25
							2.8

1935 Census figures for Total Livestock Populations in thousands.

United Provinces excluding Kinnon	9,203	23,177	10,002	818	43,290
Madras	6,817	17,700	18,700	203	43,610
Punjab	6,048	9,792	8,589	1,308	25,327
Central Provinces	2,194	11,050	2,103	185	16,322
Bombay	2,513	7,448	3,700	200	13,651
Totals	26,365	69,367	43,274	2,804	1,42,800
Rest of British India	4,768	42,147	15,111	539	62,565
Indian States 86 per cent.	12,351	42,022	33,752	1,790	89,915
Total All-India	43,084	1,54,029	92,137	5,133	2,95,280

Estimated areas available for grazing outside forest lands and numbers of livestock which are not in a position to take advantage of grazing in forest lands.

Province.	Livestock in millions.	Area available (Square miles).	Incidence per square mile.
United Provinces	42	31,000	1,335
Madras	41.3	51,000	801
Punjab	23	42,000	548
Central Province and Berar	13.1	30,000	437
Bombay and Sind	11.5	40,000	287

These figures show that the numbers of livestock which are in a position to take advantage of facilities for grazing in forest lands are only a very small fraction of the whole livestock population. The figures are for cattle alone:—

United Provinces	1 million out of 32½ millions.
Madras	1½ " " 24½ "
Punjab	1 " " 16 "
Central Provinces	3 " " 14 "
Bombay	2 " " 10 "

This gives for these 5 provinces, only 8½ millions out of a total of 97 millions.

We are not in a position to state whether any, and if so, what proportion of this vast livestock population may be fairly considered as uneconomic. From such figures as are at our disposal the indications seem to be rather that distribution and quality rather than quantity are faulty, and that while there is probably a shortage of good working bullocks in the areas of intensive cultivation, there is certainly an excess of scrub animals in the areas where cultivation is least extensive and grazing lands are commonest. How far this can be correlated with the production of cultivated fodder crops we are also not in a position to give any definite opinion but figures have been quoted to us in the specific example of the Meerut and Muzaffarnagar districts in the United Provinces as compared with Jhansi district in the same province. It has been stated that cattle in the former districts appear to be superior to those in Jhansi. It is a fact that in Meerut and Muzaffarnagar there are some 200 to 250 acres of cultivated fodder crops and only 250 acres of grazing lands to every 1,000 head of cattle; whereas in Jhansi there are 750 to 1,000 acres of grazing lands and only 1 acre of cultivated fodder crops to every 1,000 head of cattle.

9. For forest lands in the five provinces represented at this Conference the incidence of grazing varies from 1.1 acre per head in the Punjab to 4 acres per head in Madras and averages 2.8 acres. But these lands include all the dense 'timber forests' in which there is very little real grazing available. Moreover the figures are 'all' averages for very large areas, a quite high percentage of which are 'timber' free from all cultivation and habitation. There can therefore be no question that the incidence on the fringes of forest lands, near villages, and also around sources of water-supply in the interior where temporary or semi-permanent camps may be set up, must be quite unreasonably high. Everyone who has made a study of grazing management has repeatedly emphasized the fact that, not only is improvement in the quality of the grasses impossible, but deterioration is practically inevitable unless the incidence of utilization can be controlled. Such control must include limitation of numbers as well as period of utilization. Closures in rotation will ameliorate the condition of the crop; but full control of the numbers admitted to graze is essential for real improvement. We have no exact information as to what may be the correct figures for numbers per acre. Obviously it must vary greatly in every locality, being dependent not only upon natural vegetation but also upon the result of past treatment. Nor have we any information as to the varying

quality of forest grasses. From observation it appears likely that the relatively coarse grasses of the timber forests are probably poor in nutrients and useful only as roughage. The fine grasses of our (c) class pole, scrub or thorn forests are much better. There is a generally accepted empirical figure that about two acres per head of cattle is the minimum average which can be permitted with safety. But it is our opinion that both these questions of safety incidence, in various types of grass land and the nutritive qualities of different grasses are deserving of special research. Unfortunately up to now in all provinces except the Central Provinces, the safe incidence of utilization has been of purely academic interest. The charging of reasonable fees for grazing could be an indirect method of control. In the Punjab the vast majority and in the United Provinces some 68 per cent. of the animals utilizing grazing in forest lands are allowed to do so free, as an admitted right. In other provinces free grazing is frequently allowed in greater or lesser proportion as a privilege. But everywhere those animals which are required to pay fees are charged merely some token amount which bears no relation whatever to the economic value of the grazing at their disposal. These fees vary in amount but are usually between two and eight annas per annum for bulls, bullocks and cows and twelve annas to rupees two for buffaloes. Calves are usually allowed free. Sheep and goats in the Punjab pay three-fourths and two annas respectively per annum. These token payments also usually carry with them legal permission to graze over such extensive areas, for example, in Bombay Presidency roughly 3,000 square miles, that any control is automatically made impossible. Simultaneously the low rate charged actively tends to encourage the increase in numbers of useless animals. Yet even these trivial amounts are made the subject for agitation as is shown by numerous debates in Provincial Legislative Councils and also in the Council of State. The present position seems to us to be a typical example of a vicious circle. The Forest department has demonstrated already, as is shown by the examples quoted in paragraph 6 above, that much improvement is possible, by proper management, both in the quality and quantity of the grazing available in forest lands of class (c) type. Without control of the animals utilizing the improved crops, however, all such improvements are inevitably quickly dissipated by excessive grazing. They merely serve, during their existence, to encourage the survival of still larger numbers of uneconomic scrub animals. A very low rate of uniform fee encourages this process even further. The trivial fee received and the feeling of wasted effort combine to discourage the continuation, and still more so the extension, of any improvements which will cost money. Whereupon the villagers, not unnaturally, complain that the Forest department does nothing for the money it receives from them and therefore they agitate for free grazing.

10. Our terms of reference also require us to consider whether the existing methods of management of forest grazing areas ensure that these are used as far as possible for the preservation and improvement of the best types of cattle. At various times and places the possibilities of exclusion and admittance according to quality or type of animal have been considered. The conclusion has been that any such procedure involves such difficulties as to be impracticable. This is of course no reason why further efforts should not be made in this direction. Limitation by quality however presupposes limitation of numbers and the latter is necessarily antecedent to the former. Here again, therefore, the charging of reasonable fees might produce the desired result. We desire also to emphasize the point that grazing grounds upon which unlimited numbers of livestock can be maintained at no, or entirely trivial cost, inevitably become a factor encouraging the deterioration of livestock. There can equally be no question that these same grounds, with proper management, should, and could, be a valuable factor in the improvement of the cattle of India. We are advised that, especially for maintaining the quality of draught breeds of cattle, grazing is a most desirable supplement to stall feeding. Control involving limitation of numbers as may be necessary, over the cattle utilizing the grazing in forest lands is a crucial necessity without which proper management is impossible. Limitation can be effected in two ways directly by executive order or indirectly by economic pressure through fees. By the first method full control can be exercised and must rest in an expert in order to insure as far as possible that proper use is made of this power. The second method is indirect, uncertain and probably relatively slow in taking effect, and may be open to political misinterpretation as an increase in taxation. Its exact financial effects are difficult to forecast, but would increase the revenue at present received in most provinces very considerably. The precise manner in which control should be provided is therefore a matter of policy which the Government alone can decide.

11. Our considered conclusions are—

- (1) That there is scope for further improvement in the quality and quantity of grazing produced by forest lands of the type which at present carry principally poor pole scrub, or thorn forest and for the improvement of the amenities of grazing by the provision of better water-supplies.
- (2) That such improvement can only be effected by the provision of scientific management by a competent staff.
- (3) That power to control both periods of closure and numbers utilizing the grazing is absolutely essential to proper management and must be provided, if necessary, by legislation.
- (4) That proper management must involve expenditure which will not be immediately remunerative, and from which even the ultimate returns will very probably be mostly indirect. The mode of provision of the necessary funds must be decided by Government. Such expenditure should not be imposed as a further burden upon the budgets of commercial or quasi-commercial departments.

Part II.

12. Turning now to the second of our terms of reference, *viz.*, "to examine the possibilities of developing the utilization of ravine and other derelict land outside Government forests for grazing purposes in order to supplement the facilities for grazing provided in Government forests, and to make recommendations" we would like to point out, at the very outset, that it is impossible "to supplement the facilities" in Government forests for grazing for *all* the cattle in India. An overwhelming majority can never get near Government forests and even with the most intensive utilization of the land available, the total fodder-supply from grazing grounds in Government forests must always be far short of actual requirements.

13. Out of the 97 million cattle in the Punjab, United Provinces, Central Provinces, Bombay and Madras, only 8½ million can visit the forests; and it is desirable that better arrangements should be made for the fodder requirements of the remainder. The desirability of investigating the possibilities of utilization, for the purpose of fodder production, of ravine and derelict lands outside the forest is clearly indicated. The Royal Commission on Agriculture pointed out that about 20 per cent. of the total area of British India is administered by the Forest department and another 45 per cent. is classified as "cultivable waste or land not available for cultivation"; and recommended that the classification should be re-examined with a view to providing better grazing facilities for India's livestock. The Commission stated, "The ideal to be aimed at in all provinces is to distinguish between land which is suitable for the growth of good timber trees or for fuel plantations, and land which is suitable neither for timber, fuel plantations nor for ordinary cultivation, but may possess possibilities for development as fodder reserves and grazing grounds". The Commission further recommended that after reclassification such areas should be administered by a special branch of the Forest department as a demonstration of what can be done under scientific control. The report continues "Nor do we think it likely that it will ever receive the attention that should be given to it unless it is placed under the management of a division of the Forest department directly responsible for its development." With regard to the areas classed as "cultivable waste" and "land not available for cultivation", the Commission remarked, "We think it likely that within these vast areas there could be found much land which, although unsuited for commercial afforestation, might, if placed under the charge of a Minor Forest division, be used to grow fuel and provide better grazing than it now does".

14. Our reply to the first of our terms of reference shows that such reclassification of areas now under the control of the Forest department is unnecessary. This classification has already been done; and at every revision of a working plan of any forest division (generally every ten years) a complete re-survey of the area is carried out; the classification is brought up to date and the management is modified accordingly. The Central Provinces have elaborate grazing plans, evolved with the co-operation of the Revenue department, which are incorporated in each working plan. In the United Provinces and in other provinces where conditions so necessitate, working plans make separate provision for grazing facilities in grazing working circles.

15. The reclassification of areas described as "cultivable waste and land not available for cultivation" (hereinafter referred to as waste land) lying outside Government forests is, on the other hand, extremely desirable and should be carried out as early as possible. It is likely that the existing classification will be found to be out of date considering the rapid strides that Agriculture and Forestry have made during the last few decades. We think it probable that a fair percentage of such waste lands (in whichever province they exist) can be improved in a vast majority of cases. The extent to which improvement is possible depends naturally on the conditions that obtain in different provinces. In some this waste is the property of the State, in others of private individuals. These lands are subject to various land-revenue systems and no generalization is possible. In this connexion we wish to draw attention to the results obtained in the United Provinces. In the United Provinces, protection from grazing during the rains (June to November) of Usar (alkaline lands) has resulted in increasing the crop of hay in spite of grazing having been permitted after the hay harvest. The following are the figures of an actual research experiment and have been supplied to us by Mr. Smythies (for details reference may be made to the Appendix) :—

Year.	Hay, Maunds Per acre.
1931	2.75
1932	3.00
1933	5.00
1934	9.75
1935	9.25
1936	15.00

These figures show an increase of 500 to 700 per cent. in 5½ years.

16. On the poorer quality of soils the Forest department in the United Provinces have made some thousands of acres of fuel and fodder plantations in Saharanpur and Bahraich division by means of plantations with field crops, at practically no cost. With controlled logging and coppice it is hoped to obtain, according to Mr. Smythies' forecast, 600 tons of green leaf fodder and 1,500 tons of firewood per square mile of plantation per annum. The afforestation of ravine land in Etawah district is another instance of the possibility of utilizing otherwise unproductive land. Here good management was able to improve the grass crop and stop erosion.

17. There are, we believe, possibilities of extending fodder plantations in co-operation with private owners where the waste land is owned by individuals or communities. The creation of such plantations and fodder reserves should cause a substantial reduction in the quantity of cowdung now used as fuel.

18. While convinced of the possibilities of improving waste lands, we are definitely of opinion that the reclassification of such waste lands (as visualized by the Royal Commission) cannot be left to any single department of a Provincial Government. We recommend in every province the formation of a permanent Standing Fodder and Grazing Committee composed of officers deputed for the purpose by the Forest and Revenue departments and an Animal Husbandry Officer. This permanent Committee for each province should act as the Provincial Committee of a new Grazing Sub-Committee of the Imperial Council of Agricultural Research, which would then be in a position to co-ordinate the work for the whole of India. The problem is an all-India problem, but the detailed solutions must be provincial.

19. The Provincial Fodder and Grazing Committees should investigate the reclassification of waste land outside Government forests and select areas fit for the production of fodder or for management as grazing grounds and should make proposals for the control and management of such lands. Our recommendations can only apply to waste lands to which the Government right of management is clear and undisputed. We hope however that private owners may, in course of time, be induced to permit their wastes on scientific lines provided that some organization is brought into existence for their assistance.

20. We have considered the question of agency required for the management of areas selected for fodder and grazing purposes and we are of opinion that the Provincial Fodder and Grazing Committees would be best able to advise the Local Government what may be the most suitable agency for this purpose. In addition the Provincial Committees should draw up schemes for research on appropriate subjects for submission to the Imperial Council of Agricultural Research for grant of aid for these investigations.

21. In brief our conclusions and recommendations therefore are—

- (1) That there is great scope for the introduction of proper management in lands which up to the present time have been outside the orbit of the activities of any of the technical departments.
- (2) That the organization of such improvements should vest in special Standing Fodder and Grazing Committee to be formed in each province and that their activities should be co-ordinated by a new Fodder and Grazing Sub-Committee of the Imperial Council of Agricultural Research.

Chairman.

C. G. TREVOR, C.I.E., Inspector-General of Forests to the Government of India.

Members.

T. A. WHITEHEAD, I.F.S., Chief Conservator of Forests, Madras.
 E. A. SMYTHIES, I.F.S., Conservator of Forests, United Provinces.
 C. M. HARLOW, I.F.S., Conservator of Forests, Central Provinces.
 E. A. GARLAND, I.F.S., Deputy Conservator of Forests, Bombay.
 N. P. MOHAN, I.F.S., Deputy Conservator of Forests, the Punjab.
 W. S. READ, Punjab Veterinary Service.
 R. D. PAUL, Madras Civil Service.

APPENDIX XXX (c).

STATISTICS OF MAKHDUMPUR Usar EXPERIMENT, UNITED PROVINCES.

1. This experiment (started July 1931 by the Forest Research Branch, United Provinces) of 32½ acres was started to test the possibilities of improving fodder supplies from usar plains (the area of which in the United Provinces is 8,000 square miles, far greater than the total area of Government forest). The control of the experiment is complete, and the data obtained are therefore reliable.

2. The lay-out is as follows:—

All plots and sub-plots.—Complete protection every monsoon June to November.

Plot 1-1—Grass cut every year in November, and then open to unrestricted grazing for six months.

Plot 1-2—Grass cut every year in November, and then protected from grazing.

Plots 2-1 and 2-2—One and a half years' complete rest. Thereafter treated as sub-plots 1-1 and 1-2 respectively.

Plot 4—Five and a half years' complete rest. Grass cut for first time in November 1936.

Year.	All figures in maunds of hay per acre.					Remarks
	Sub-plot 1-1.	Sub-plot 1-2.	Sub-plot 2-1.	Sub-plot 2-2.	Plot 4.	
1931. . .	2.75	2.75	NH	NH	NH	1. All hay for plot dried for 10 days and then stored in Nantankh.
1932. . .	3.0	4.75	5.75	4.5	NH	
1933. . .	5.0	9.25	5.5	9.0	NH	
1934. . .	9.75	12.0	8.25	10.0	NH	2. The hay of 1932, 1933, and 1934 was stored in Nantankh.
1935. . .	9.25	11.75	8.0	10.5	NH	
1936. . .	15.0	20.0	15.5	17.0	15.0	
Total to date .	44.75	60.5	42.0	51.0	15.0	
1936 green grass	15.0	23.0	15.0	22.0	25.0	

3. The tentative conclusions which the above figures indicate are:

(i) That protection from grazing during the monsoon has a marked effect on increasing grass yield.

(ii) That opening to grazing (after hay cutting) has a marked effect on increasing grass yield. The increase is more marked in plots 1-1 and 2-1 than in plots 1-2 and 2-2.

(iii) That a five and a half years' complete rest has a marked effect on increasing grass yield. The increase is more marked in plot 4 than in plots 1-1 and 2-1.

(iv) That the hay of 1932, 1933, and 1934 was stored in Nantankh.

The hay of 1935 and 1936 was stored in Nantankh. The hay of 1937 and 1938 was stored in Nantankh. The hay of 1939 and 1940 was stored in Nantankh. The hay of 1941 and 1942 was stored in Nantankh. The hay of 1943 and 1944 was stored in Nantankh. The hay of 1945 and 1946 was stored in Nantankh. The hay of 1947 and 1948 was stored in Nantankh. The hay of 1949 and 1950 was stored in Nantankh. The hay of 1951 and 1952 was stored in Nantankh. The hay of 1953 and 1954 was stored in Nantankh. The hay of 1955 and 1956 was stored in Nantankh. The hay of 1957 and 1958 was stored in Nantankh. The hay of 1959 and 1960 was stored in Nantankh. The hay of 1961 and 1962 was stored in Nantankh. The hay of 1963 and 1964 was stored in Nantankh. The hay of 1965 and 1966 was stored in Nantankh. The hay of 1967 and 1968 was stored in Nantankh. The hay of 1969 and 1970 was stored in Nantankh. The hay of 1971 and 1972 was stored in Nantankh. The hay of 1973 and 1974 was stored in Nantankh. The hay of 1975 and 1976 was stored in Nantankh. The hay of 1977 and 1978 was stored in Nantankh. The hay of 1979 and 1980 was stored in Nantankh. The hay of 1981 and 1982 was stored in Nantankh. The hay of 1983 and 1984 was stored in Nantankh. The hay of 1985 and 1986 was stored in Nantankh. The hay of 1987 and 1988 was stored in Nantankh. The hay of 1989 and 1990 was stored in Nantankh. The hay of 1991 and 1992 was stored in Nantankh. The hay of 1993 and 1994 was stored in Nantankh. The hay of 1995 and 1996 was stored in Nantankh. The hay of 1997 and 1998 was stored in Nantankh. The hay of 1999 and 2000 was stored in Nantankh.

APPENDIX XXXI.

NOTE ON SUBJECT No. 35, BY COL. A. OLVER.

At the first meeting of the Animal Husbandry Wing in 1933, in my note on "the organization necessary for the future development of Animal Husbandry in India" I submitted figures to show how inadequate was the provision made by Provincial Governments for the development of Animal Husbandry by Government Agency.

The data given in that note were necessarily only approximate because exact figures were not in all cases given of the amounts allotted for Animal Husbandry work from Agricultural Budgets and some of these have since been changed so that it is now even more difficult to obtain exact information from them as to the proportion which is allotted to livestock improvement. From information supplied by local Governments I am however able to give, in the attached table, the exact amounts which were allotted for such work during the year 1935-36.

From these data, though it is claimed that considerable development has taken place, it is clear that the allotment of funds for such work and for Animal Husbandry as a whole is still very inadequate and disproportionately small compared with what is spent on Plant Husbandry. Moreover, there is still, in most provinces, nothing which can be described as a comprehensive Animal Husbandry organization, such as exists in other countries, with staff and facilities for dealing all aspects of Animal Husbandry under the unified control of a specialist in such work. Only in the Punjab and North-West Frontier Province is Animal Husbandry work of all kinds dealt with by one department, *viz.*, the Provincial Veterinary Department, under the unified control of a specialist and it is significant that in these provinces progress in organised livestock improvement has greatly exceeded that of provinces in which similar unified control does not exist and in which at present some Animal Husbandry matters are dealt with by the Director of Agriculture, some by Director of Veterinary Services and some not at all.

In view of this the Government of India has recently recommended to Provincial Governments that they should consider the formation of Provincial Animal Husbandry Departments and I submit for your consideration some general proposals which I hope may prove of assistance in overcoming the very grave obstacle to co-ordinated development of agriculture in India which is involved in the present jealous division of labour and control in the Animal Husbandry Field.

In making such proposals it is clearly necessary to confine oneself strictly to what is feasible for Provincial Governments, having regard to the expenditure involved, and for that reason it appears to me that in forming such Departments the fullest use must be made of the existing Provincial Veterinary Departments which, for the control of disease, must in any case be maintained in the closest possible touch with livestock and livestock-owners, particularly in the best breeding areas.

Moreover, it seems to me clear that in India of the future veterinarians, who are drawn as far as possible from stock-owning families and who have undergone years of intensive training in the care of livestock to which they have devoted their lives, are likely to be the best material available for carrying on the systematic Animal Husbandry development which is so much needed and so much of which, such as castration and inoculation, is purely veterinary work, which no Government Department ought to countenance except under veterinary supervision.

My proposal, therefore, is that Animal Husbandry work of every kind shall, in future, be dealt with by the existing Provincial Veterinary Departments with the assistance of such specialist livestock staff as already exists, much on the lines which are at present followed in the Punjab. There all Animal Husbandry work is dealt with by the District Veterinary Staff, with the assistance of specialists in certain cases. The Superintendent and Fodder Specialist at the Hissar Farm and the Poultry Specialist are not being veterinarians. These appear to me the only practicable lines along which to proceed since no Government will, in my view, be able to go to the expense of forming an entirely separate organization for livestock improvement work. Moreover, it seems that such a further division of duties is likely to be very costly and to lead to difficulty in working. Since it is unfortunately a fact that these Directors do not always see eye to eye, particularly in the matter of organization of the systematic breeding control which, in my view, is essential to adequate progress in the development of Animal Industry in India.

That the livestock officers who were employed under the control of Director of Agriculture in most provinces of British India have done good work with the funds and facilities at their disposal I fully admit but without an Animal Husbandry organization at their backs covering the whole province or at least the principal areas where livestock are bred and devoted solely to livestock interests, it is difficult to understand how they could have been expected to produce the general improvement of the stock of the country which is needed. It seems to me, therefore, that the right policy would be to amalgamate all the livestock personnel at present employed under Provincial Directors of Agriculture with the existing Provincial Veterinary Departments and to place Animal Husbandry work of all kinds, e.g., disease control, breeding control, systematic castration and inoculation of improved animals and official registration of pedigree stock, as well as the marketing of Animal Products, under the general control of a Director of Animal Husbandry, on the lines which have been so successfully followed in eminently successful agricultural countries such as Denmark, the United States of America, New Zealand, Australia, the Union of South Africa and all the more important British Colonies, in which for years past all Animal Husbandry work has been under the sole control of an Animal Husbandry Organization devoted solely to the interests of Livestock and to the development of Animal Industry. In these countries the Heads of these organizations are qualified veterinarians but I do not consider it essential that the present heads of the Provincial Veterinary Services of British India should, in all cases, take over control of the proposed Animal Husbandry Departments. Who is to control such Departments is a matter for Provincial Administrations to decide, depending to some extent on the relative seniority and administrative experience of the Director of Veterinary Services and other Officers concerned with particular branches of Animal Industry in the provinces concerned. But in forming Animal Husbandry Departments care should in any case be taken that the prospects of any livestock personnel absorbed into them would not be adversely affected and that specialists in the different aspects of Animal Husbandry were given adequate control, under the Director of the Animal Husbandry Department, in such a way that each would be in a position to develop his own line of work in collaboration with other sections and with Provincial Agricultural Departments.

I visualize, for example, that specialists would be needed in Dairying, sheep and goats and poultry, and for the marketing of Animal Products and it would be necessary that the Director of Animal Husbandry should have, at his sole disposal, funds and facilities more in conformity with the greater economic importance of livestock and livestock products in comparison with crops than is at present the case; *cfr.* the figures given in the above table. From these it may be seen that the total expenditure on Animal Husbandry work of all kinds, including disease control and the treatment of the sick and veterinary education, is less than half the amount spent on plant husbandry though it is generally admitted that in India Livestock are of special importance because they are used for cultivation of the land and milk is of special value because the diet of the people is predominantly vegetarian.

Moreover, it may be seen that the average allotment for livestock improvement in the provinces where it is controlled by Provincial Agricultural Departments is approximately 7.57 per cent. and is thus even less than the figure of 8.7 per cent. which I gave in my note on "The organization necessary for the future development of Animal Husbandry in India" in 1933 though it is claimed that considerable development of Livestock Improvement work has taken place in certain provinces.

That adequate progress can be made in this work with such an allotment no one could I think contend and the time seems more than ripe to form Animal Husbandry Departments, in all provinces and States, which can devote the whole of their thought and energies to the development of livestock and livestock industry without any countervailing interests to consider.

In this connection it is of interest that in the Punjab the proportion of funds allotted for veterinary and animal husbandry work combined, out of the total which is provided by the Provincial Government for agriculture as a whole, is no greater than the average of the provinces in which livestock improvement is under the control of Directors of Agriculture. Yet the extent of controlled breeding, castration, etc., carried on by the Punjab Veterinary Department, is far in excess of that of any other province or indeed of all the rest of British India put together and at the same time the provision for disease control, the treatment of cases and veterinary education in the Punjab compares very favourably with that of any other province.

This, in my view, is a very clear indication that Animal Husbandry work of all kinds could be both economically and efficiently carried out, if more use were made of the existing Provincial Veterinary Departments for such work. Moreover, if funds were allotted to Animal Husbandry Departments strictly in accordance with the economic importance of livestock and livestock products, in comparison with that of crops, it would be possible for such departments greatly to extend the measures which are at present adopted for the development of Animal Industry in India.

I have not entered into detail because this is a matter for each province or State to deal with in accordance with local circumstances but I feel that I have said enough to indicate the lines along which, in my view, Provincial Animal Husbandry organizations should be built up, without which it is I think now clear that adequate progress in the co-ordinated development of Animal Industry is unlikely to be achieved within a reasonable space of time and at reasonable expense.

In conclusion I would like to say that in dealing with this very controversial subject I have been guided by years of experience of the working of Animal Husbandry organizations such as, I advocate, in South Africa and the United States of America, where Animal Industry and Plant Industry are under entirely separate control, and by what I have seen during the past six years in this country. From this experience I feel sure that there is every reason to anticipate that these two great divisions of agriculture could thus be developed side by side far more effectively and with much less friction than is liable to occur in the circumstances which exist in India at present.

Comparative statement showing expenditure on Plant and Animal Husbandry work in Provinces during 1935-36.

[Sources : 1. Provincial budgets (revised estimates for 1935-36). 2. Communications from Local Governments.]

Name of Province.	Animal Husbandry (Total budget of Veterinary Depart- ment. Allotment for Livestock from Agriculture De- partment budget minus expenditure on Veterinary College).	Plant Husbandry (Total budget of Agriculture De- partment minus allotment for live- stock minus ex- penditure on College).	Total 'Agriculture' excluding expendi- ture on Agriculture and Veterinary Colleges. (Columns 1+2).	Percentage of total spent on Veterinary and Livestock. (Column 1/ Column 3).	Allotment for Livestock work from budgets of Agriculture Departments.	
					Amount.	Percentage.
	1	2	3	4	5	6
Madras	Rs. 9,07,100	Rs. 15,82,700	Rs. 25,49,800	37.93	Rs. 1,15,800	8.27
Bombay	4,03,000	10,00,000	14,03,000	28.86	91,000	7.40
Bengal	3,82,087	9,40,633	13,22,700	28.88	54,367	5.48
Punjab *	11,71,036	23,60,264	35,31,300	33.16	*	..
United Provinces	5,56,738	19,11,562	24,68,295	22.47	1,20,738	5.23
Central Provinces	4,81,020	7,03,346	11,84,366	40.61	95,020	10.55
Bihar and Orissa *	4,82,993	6,49,300	11,32,392	42.74	*	..
Assam	2,56,589	3,71,495	6,28,084	40.84	1,15,386	23.08
North-West Frontier Province	1,28,700	2,15,000	3,43,700	37.44	..	..
Average excluding Punjab, Bihar and Orissa and North-West Frontier Provinces.					..	7.57

* Expenditure on livestock work is met wholly from Veterinary Budget or partly from Veterinary and partly from Agriculture budgets. Hence figures are not given.

APPENDIX XXXII.

NOTE ON SUBJECT No. 36, BY MR. F. WARE, F.R.C.V.S., I.V.S., DIRECTOR,
IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.

The operation of castration, by which for the purposes of this note is meant the removal or destruction of the male gonads, in order to render domesticated animals more tractable for the work required of them, is one that has been practised from the earliest times by stockmen and it is only in comparatively recent years that the necessity for arranging for this operation to be carried out with the minimum amount of pain to the animal concerned and maximum amount of efficiency has attracted the attention of those concerned with the welfare of the domestic animals.

In this country a vast amount of cruelty has been perpetrated on domestic animals in the past during the performance by quack cow doctors of the operation known as "Mulling", which consists in crushing the testes and spermatic cord between stones or pieces of wood. This operation is still in vogue in some parts of the country, but there has been a great diminution in its practice, and concurrently in the amount of suffering caused to domestic animals in India, since the inception of the Civil Veterinary Department, which has taken very active steps to substitute more rational and efficient methods of performing the operation. That this department has already achieved very good results from its efforts will be seen from the figures below, which are taken from the available reports of the Civil Veterinary Departments working in British Provinces in India for the past 40 years:—

Year.	No. of castrations performed.
1894-95	307
1904-05	1,088
1914-15	25,461
1924-25	1,04,996
1934-35	6,08,925

The very large rise in the figures during the last decade is undoubtedly due to the introduction on a large scale amongst the executive staff of the Civil Veterinary Department of the instrument known as the Burdizzo castrator, which in the hands of a trained operator will perform the operation expeditiously, efficiently, with a minimum amount of pain to the animal, and without the loss of blood.

Unfortunately, however, the introduction by the Veterinary Department of this comparatively simple method of performing the operation has led to the idea that it is only necessary to provide a man in charge of cattle with a Burdizzo castrator and tell him to carry on in order to obtain and supplement the good results that have already been demonstrated by the Veterinary Department with this instrument. This, of course, is not the case, and one has only to visit a herd of cattle in which an untrained operator has been at work, to see unmistakable signs of young bulls having been "left proud", with all the troubles both to themselves and the cows in the herd attendant on this condition.

It is not suggested that the operation of castration cannot be performed satisfactorily by anyone but a Veterinary graduate, but it is emphatically contended that a Government department should not be guilty of employing untrained men without expert supervision for the performance of this operation and so again exposing the animals of this country to the pain and inconvenience to which they were liable when the operation of "Mulling" was the common one, before the Veterinary Department took steps to alleviate their condition.

The desire to augment the number of castrations already being performed by the executive staffs of the Veterinary Department is readily understood and to be encouraged and there appear to be no inherent difficulties in the way of doing this by the aid of a staff of trained stockmen working under the supervision of members of the Veterinary Department. These men could be given a short course of instruction at Veterinary hospitals, which might include other subjects bearing on the development of Animal Industry in this country, and then placed out in a district under the supervision of the local Veterinary staff, so that both their work and their instruments could be inspected periodically by a Veterinary graduate.

It may not be generally known that in Europe the operation of castration is now looked upon as a major one and legal enactments have already been made in England, Germany and Norway, which direct that castration in certain classes of animals shall be performed only under an anaesthetic, thus making it incumbent on the operator either to be or to employ a qualified Veterinary graduate. It would, perhaps, be attempting to advance too rapidly to suggest that the Act for the Prevention of cruelty to animals in India should be amended to include such a clause, at the present time, but it is submitted that the least this meeting should do is to register its disapproval of any action likely to cause unnecessary pain to an animal, by recommending to local Governments that they should not employ unqualified men to perform the operation of castration on animals, unless they are subject to Veterinary supervision.

APPENDIX XXXIII.

NOTE ON SUBJECT No. 37, BY RAO, BAHADUR M. VAIDYANATHAN, M.A., L.T.,
STATISTICIAN, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

Introduction.

It is now felt more and more urgent that *well-planned* experiments should be conducted and appropriate statistical analysis adopted to answer specific questions on nutrition, dairying and control of diseases of animals of the same or different breeds; and lack of proper designs for such experiments in the past in India had confused the issues and misled the experimenter. For example, taking the subject of nutrition, want of proper technique has been the bane for a proper estimation of digestibility, which is found to involve a consideration of a number of factors such as the correction for initial differences in animals tried, the effects of different nutrients as shown by amounts consumed (i.e., the balance of dry matter, organic matter etc.), and also the interaction existing between different types of food entering the feed (such as mixture of cake, grass, paddy, straw, etc.) all of which are not, generally speaking, subject to a correct estimation. Given a group of animals fed by different rations, the problem is how to assess the percentage of the different foods consumed, and in such a case the statistical method of regression seems full of possibilities, as conclusions are then based upon actual field data; thus from the data of a number of animals observed (the larger the number, the better) if X_1, X_2 be the percentages consumed, say of dry matter, of two different types of food then $AX_1 + BX_2$ may be assumed to be the percentage consumed of the *compound food*, where A and B are the best* values calculated from a number of animals uniform in age and other physical characters. The essential point to be noted, however, is that for evaluating a *correct* regression, the number of animals to be experimented upon should be fairly large, but it seems almost impossible to fix a limit to the number of animals to be taken for such experiments, owing to practical difficulties involved. But in every case the significance of regression should be tested by the usual 'analysis of variance' and 'Z' test (vide Enclosure I). The same principle of regression has been employed with success in experiments where for example, true strach equivalent or true protein equivalent content of foodstuffs have to be worked out from *crude* protein which is done by assuming a regression (say $y = ax + b$) from the available samples of those variables and calculating the best values of a and b . The *method of regression* has again been found to be efficacious when with different doses of food different increases in live-weight are observed in a sample of animals; here the assumption of 'regression' between the two variables corrects the differences in feed-consumption and is found to provide a better criterion for 'significance'. Again 'covariance' (i.e., regression of one set of data on another) applied in all modern Animal Husbandry experiments to correct for initial differences in milk-yields, weights etc., is a very important statistical application which has given very valuable results; and this has been discussed in the following para.

Application of 'covariance' to experiments on Animal Husbandry.

The statistical application of 'covariance' is simple enough; it is merely assuming a law of regression (linear regression is the simplest), between two sets of variations, (say at two different times) such as, for example, where a set of experimental data are known to have been influenced by differences between treatments before the experiment started; and thus, by such an assumption, a correction is made on the experimental data on the basis of initial observations. It has been shown in articles on Animal Husbandry that such a correction is a necessity having immense value, particularly when individuals exhibit greatest individuality, and that the efficiency

*By applying the classical method of least squares, the values of A and B are evaluated.

of the experiment as measured by the corrected random error is considerably increased by such an assumption. The utility of the method is best appreciated in the case of nutrition experiments, where for example each cow has an individuality of its own irrespective of its breed, and the stage of lactation. If groups of animals of different breeds are to be compared for comparing effects of different treatments, then with a view to minimise differences in individuality, it has been suggested by some workers that the usual method of comparing different treatments by continuing the same treatment for an animal throughout the experimental period should be substituted by what is known as 'change over type method', by which every animal is given *all* the treatments in succession during the experimental period; but defects in this method are found to be that the number of treatments to be tried cannot be many, and that the period of the experiment too cannot be sufficiently long. Bartlett has shown (J. A. S. April 1935, pp. 238-244) that provided the design is of 'randomised block type' (with all the conditions governing it), the differences in treatments during *any* period of the experiment can always be corrected by the method of covariance on the basis of the data relating to the period prior to it. In fact, if the animals are properly grouped or 'blocked' in such a way that the animals in each group are as many as the number of treatments, and that the variation within each group is not abnormal (that is to say, for example, the lactation curves of the individuals in each group are almost the same) then the correction of the data, assuming regression on preliminary observations will always result in an improved precision, and will further indicate the *duration* of the control period, during which time the rationing should be kept uniform. It has been shown by Bartlett (J. A. S. April 1935) that *three weeks' uniform* treatment is a satisfactory duration to correct for initial differences; but that is a point to be settled for each type of experiment. An example of the illustration of method of 'covariance' is given in Appendix II.

Correction for animals giving abnormal results.

Experience shows that however short the experimental period may be, experimental animals sometimes get 'diseased' during the period under observation, or are found to give abnormal results. In agricultural experiments where it is possible to have a sufficient number of replications, one or two 'missing plots' may not very much affect the criteria of significance, but in dealing with animals which cannot be sufficiently replicated, a proper statistical *correction* is a necessity in the case of animals giving abnormal results during experimental period. The best course seems to be to weed out such 'abnormal' data, substituting new values by a formula of correction on the basis of results of animals similarly positioned and treated in the experiment. But where the animal is completely disabled or cannot serve reliable data during the rest of the experimental period, it has been suggested that a new animal of the same breed (and lactation) may be substituted. From the 'experimental design' on which the calculation of 'error' is based, the 'missing values' are evaluated, the principle being that the 'residual variance' should be the least consistent with the new values obtained. In Enclosure III is given an example for calculation of substituted values in such cases.

Complex field experiments on Animal Husbandry.

In judging the nutritive values of different feeds, the chief variables involved are the *breed*, and the *treatment*; and to this should be added the *time factor* (i.e. the effect of season) which, in the case of nutritional experiments, particularly, seems a very important consideration for drawing any valid inference. Thus, while comparing different treatments (say 3) for effects on different breeds (say 4) for their nutritional effects, any experimental design should take into account not only the combinations of breeds and treatments (i.e., 12 ultimate treatments in this case) but also different periods (say, 3 consecutive experimental periods) for the same ration. This last aspect is sometimes answered by the 'change over type' of layout referred to already, wherein each cow receives the three treatments alternately during the three periods, but during the same period all the ultimate treatments are represented in

three distinct groups A, B and C as shown below with different animals of the same breed receiving different treatments :—

Design of a complex experiment (B=breed, T=treatment, M=individual experimented).

Period.	Breed.	Group A Treatments.			Group B Treatments.			Group C Treatments.		
		T ₁	T ₂	T ₃	T ₁	T ₂	T ₃	T ₁	T ₂	T ₃
I	F ₁ F ₂ F ₃ F ₄	M ₁ M ₄ M ₇ M ₁₀	M ₂ M ₅ M ₈ M ₁₁	M ₃ M ₆ M ₉ M ₁₂	M _{2'} M _{5'} M _{8'} M _{11'}	M _{3'} M _{6'} M _{9'} M _{12'}	M _{1'} M _{4'} M _{7'} M _{10'}	M _{2''} M _{5''} M _{8''} M _{11''}	M _{1''} M _{4''} M _{7''} M _{10''}	M _{3''} M _{6''} M _{9''} M _{12''}
II		T ₂ The same animals as above.	T ₃ The same animals as above.	T ₁ The same animals as above.	T ₂ The same animals as above.	T ₃ The same animals as above.	T ₁ The same animals as above.	T ₂ The same animals as above.	T ₃ The same animals as above.	T ₁ The same animals as above.
III		T ₃ The same animals as above.	T ₁ The same animals as above.	T ₂ The same animals as above.	T ₃ The same animals as above.	T ₁ The same animals as above.	T ₂ The same animals as above.	T ₃ The same animals as above.	T ₁ The same animals as above.	T ₂ The same animals as above.

(" Dashes " show that individuals differ in different groups.)

In the above complex arrangement (a split-plot design of $4 \times 3 \times 3$ arrangement) involving 36 animals under experiment, the animals of the same breed are alternated in a cyclic order with respect to treatments in the same experimental period, and the treatments are similarly alternated in a cyclic order in different periods. 'Groups' serve as 'replications' for estimating error but where groups themselves differ intrinsically (which may arise for example on account of different lactations of animals in different breeds considered), higher order interactions as explained below will form the basis for the calculation of error. Thus in the eventual analysis we shall be separating the sum of squares due to (1) groups, (2) breeds, (3) treatments, (4) periods and several interactions of these factors.

Analysis of variance in this case will be :—

Item of variance.	Degrees of freedom.
Groups	2
Periods	2
Error (α) (Groups \times periods)	4 "error".
Total	8
Breeds	3
Treatments	2
I.—Order interactions—	
Periods \times breeds	6
Breeds \times treatments	6
Periods \times treatments	4
Groups \times breeds	6
Groups \times treatments	4
II.—Order interactions—	
Periods \times breeds \times treatments	12
Groups \times periods \times breeds	12
Groups \times periods \times treatments	8
Groups \times breeds \times treatments	12
III.—Order interactions—	
Groups \times periods \times breeds \times treatments	24 "error".
GRAND TOTAL	107

It may be seen from the above analysis that from the above design 'errors' are divided into two separate types:—(1) for periods and groups (two of the main effects), (2) for the other main effects and all interactions. Again so long as the three 'groups' are treated as replications of the 12 ultimate treatments, every item involving 'groups' contributes to 'error' on which comparisons of other items depend. But where animals of the same breed in different groups show individuality (including for example effects of lactations which are not separately considered in this experiment), first order and second order interactions involving 'groups' cannot form a valid portion of 'error', and it has been suggested that still higher order interactions available (in this case third-order interaction, i.e., groups \times periods \times breeds \times treatments) may be taken as the basis for 'error' as in the case of 'confounded' experiments in agricultural field technique. An illustration of this principle is given in Enclosure II.

It should be further noted that differences between experimental periods may be corrected by the method of 'covariance' as already explained.

Sampling technique in animal-husbandry experiments.

The problem of 'sampling' in experiments where selection of animals is involved, or where again for laboratory work compositions of food-stuffs of animals have to be tested, a proper and satisfactory sampling technique is a necessity, without which valid inferences are not possible. Cases have arisen in some of the experiments reported in India and elsewhere, where 'sampling' is involved, that 'sampling variance' has exceeded a reasonable margin of 'error limits', which has disturbed the efficiency of such experiments. Thus, for example, as a simple case to draw inferences with regard to incidence of diseases, without reference to the total number in the tract or to the number affected would be statistically untenable. Again, for example, to test the composition of 'hay' in experimental plots where particular manures are applied, for a proper sampling not only should the samples be taken at random from the experimental plots, but should also be representative of the plot from which the samples are taken. The efficiency of the experiment will depend upon 'sampling error' so evaluated. An example is given in Enclosure IV, which will illustrate the out-line of the principle involved.

Example.

From 8 plots under 8 different treatments, with four replications of the whole set, 4 samples are taken from each plot (each sample being taken from each of the four equal parts into which the plot is divided). In this case, the analysis will be—

Variance due to	Degrees of freedom.
(1) Replications	3
(2) Between treatments	7
(3) Within plots	21
Total " between plots "	31
(4) " Within plots " and " between parts of a plot "	92
Total " between parts of a plot "	125
(5) Between " samples " (within parts of a plot)	386
GRAND TOTAL	511

Now (5) provides the sampling error. The percentage sampling error is based upon the general mean of the results which will show the degree of efficiency of the experiment. In Appendix IV is illustrated the method of calculation.

Summary and conclusions.

1. It has been shown that a proper planning of experiments in Animal-Husbandry is a necessity.
2. The principle of covariance which corrects the experimental data on the basis of initial observations has been found eminently satisfactory.
3. A proper statistical correction is necessary when a few experimental animals are 'disseminated' or found to give abnormal results during the experimental period.
4. 'Complex experiments' involving several factors are found very efficient in Animal-Husbandry experiments, and should be properly planned.
5. A proper sampling technique is a necessity, where samples have to be taken for experimental tests.

ENCLOSURE I.

TESTING REGRESSIONS FROM SAMPLES.

Example.

Sample animal.	X.	Y.
	Food consumed (in lbs.).	Gain in live-weight.
1	17	0
2	19	13
3	21	25
4	25	27
5	26	50
6	28	54
7	29	62
8	30	62

Calculate 'regression coefficient' from the formula :

$$b = \frac{S_y (\sum x - \bar{x})}{S(\sum x - \bar{x})^2}$$

(\bar{x} is the mean of Σ values)

(Calculation of 'b' is not necessary for testing regression).

For testing significance of 'b' calculate the linear component of 'sum of squares' by the formula :

$$\left\{ \frac{S_y (\sum x - \bar{x})}{S(\sum x - \bar{x})^2} \right\}^2$$

The remainder of 'sum of squares' i.e. subtracted from $S(S - \bar{y})^2$ goes to 'deviations from regression' as shown below :—

	Degrees of freedom.
Linear component	1
Deviations	6
Total	7

In the present case :— $b = 0.38$.

	Degrees of freedom.	Sum of squares.	Mean square.
Linear component	1	2,205.4	2,205.4
Deviations	6	1,690.0	281.7
		3,896.0	

Application of 'F' test.

$$F = \frac{2205.4}{281.7} = 7.9$$

From Snedecor's tables (Calculation and Interpretation of Analysis of Variance and Covariance Iowa Pages 88-91) :—

$$n_1 = 1, n_2 = 6 \quad \therefore P = .05$$

$$F = 5.99$$

In the present case $F = 7.9$. Hence 'regression' is significant in this example.

ENCLOSURE II.

Application of 'Covariance'.

(Data from Journal of Nutrition, No. 3, 1934).

Lbs. feed (X).

Lot I.	Lot II.	Lot III.
382	377	441
335	403	399
388	376	362
316	381	372
319	345	357
399	359	367
358	360	396
355	352	349
344	331	380
339	327	346

Lbs. live weight gain (Y).

Lot I.	Lot II.	Lot III.
66	88	90
72	92	85
84	86	76
47	90	82
75	85	85
87	82	79
75	80	93
73	96	72
59	84	85
70	77	81

Analysis of Variance of "X".

Variance due to	Degrees of freedom.	Sum of squares.	Mean square.
Between lots	2	2,853.50	1,426.75
Between replicates	9	10,721.50	1,191.28
Error	18	9,133.55	507.42
Total	29	22,708.55	..

Analysis of Variance of "Y".

Variance due to	Degrees of freedom.	Sum of squares.	Mean square.
Between lots	2	1,299.27	639.63
Between replicates	9	331.16	37.13
Error	18	1,540.72	85.60
Total	29	3,154.15	..

Analysis of Covariance of "X" and "Y".

Covariance due to	Degrees of freedom.	Sum of products.	Mean covariance.
Between lots	2	1,143.11	571.55
Between replicates	9	980.16	108.91
Error	18	2,832.28	157.35
Total	29	4,955.55	..

Value of 'b' for error 0.3101

Analysis of Variance of "Y" corrected for "X".

Variance due to	Degrees of freedom.	Sum of squares.	Mean square.
Between treatments	2	844.71	422.35
Between replicates	9	757.27	84.14
Error	17	662.45	38.97
Total	28	2,264.42	..

By correcting for 'X', error mean square has become reduced to 38.97 from 85.60.
Hence the increased precision.

$$Q = \frac{85.60}{38.97}$$

= 2.2 times the original precision.

APPENDIX II.

(2)

Design of a 'complex experiment' and method of statistical analysis.

Daily Milk Yields.

		Group A.			Group B.			Group C.		
		T	T ₂	T ₃	T ₁	T ₂	T ₃	T ₁	T ₂	T ₃
Experimental period I.	F ₁	40	42	45	35	40	44	34	38	37
	F ₂	30	29	26	27	26	22	28	26	24
	F ₃	52	56	58	44	50	52	48	52	55
	F ₄	61	65	69	58	57	64	58	62	64
Experimental period II.	F ₁	42	46	47	39	39	45	39	42	42
	F ₂	32	31	27	26	32	46	30	30	32
	F ₃	54	58	56	42	54	53	50	54	58
	F ₄	60	63	71	65	58	65	56	65	66
Experimental period III.	F ₁	46	49	54	42	41	48	42	44	45
	F ₂	36	27	35	28	45	52	34	52	34
	F ₃	55	54	37	44	48	54	56	56	60
	F ₄	64	63	74	69	62	68	62	68	68

Analysis of Variance.

Variance due to	Degrees of freedom.	Sum of squares.	Mean square.
Periods	2	556	278*
Groups	2	69	34.5
Periods × groups	4	142	35.5
Breeds	3	14,863	4,954.3†
Treatments	2	408	204*
Breeds × treatments	6	81	13.5
Breeds × periods	6	366	61*
Treatments × periods	4	18	4.5
Treatments × groups	4	146	36.5
Breeds × groups	6	310	51.7
Breeds × treatments × periods	12	237	19.75
Breeds × periods × groups	12	174	14.5
Treatments × periods × groups	8	83	10.37
Treatments × breeds × groups	12	442	36.83
Periods × treatment × breeds × groups	24	400	16.7
Total	107	18,295	..
Total error variance =	$\frac{1,555}{66}$	= 23.6	

The items marked * are significant, as compared to "error".

ENCLOSURE III.

Formula for 'correction of abnormal yields'.

(One 'abnormal' unit)

Consider the following example :—

Milk yields (in lbs.).

Treatments.	Groups.			Total.
	A.	B.	C.	
1	38	34	33	105
2	42	47	37	126
3	45	45	19* (=x)	90
4	49	52	51	152
Total	174	178	121 (Omit x).	473

* "Abnormal yield" which should be omitted from analysis.

Now assume p, the number of treatments q, the number of groups and T the total of known yields; assume also P, Q, the totals of groups and treatments where x occurs, then the formula for the 'missing' yield is :—

$$X = \frac{pP + qQ - T}{(p-1)(q-1)}$$

In the present case :

$$\begin{aligned} p &= 4, & q &= 3, & T &= 473 \\ P &= 121 & Q &= 90 \\ \text{then } X &= 40 \end{aligned}$$

* Vide Yates' article on "The analysis of replicated experiments when the field results are incomplete" in *Experimental Agriculture*, 1933.

ENCLOSURE IV.

Method of Calculation of 'Sampling Error'.

Results of observations of *crude protein* (per cent. of dry matter) are noted from hay grown in 8 plots under 8 different treatments (with 4 replications); and four samples of hay are taken from each plot. Required to calculate sampling error, the mean of all observations being found to 7.62 per cent. (Data are omitted).

The following analysis of variance is obtained :—

Variance due to	Degrees of freedom.	Sum of squares.	Mean square.
(1) Replications	3	14.76	..
(2) Between treatments	7	12.45	..
(3) Within plots	21	10.76	0.51
Total 'between plots'	31	37.97	..
(4) "Within plots" and "between parts of plot".	94	64.62	..
Total "between parts of a plot"	125	102.59	..
(5) "Between samples" (within parts of a plot).	386	104.76	0.27
GRAND TOTAL	*511	227.35	..

Sampling error of each sample taken = 3.5 per cent. of mean.

Sampling error per plot = 3.5

$$= \sqrt{\frac{32}{3}} = 0.62$$

It may be further noted that "variation within plots" does *not* significantly differ from 'between samples'.

(as $F = \frac{0.51}{0.27} = 1.9$ which is less than theoretical F

for $n_1 = 21$, $n_2 = 386$ and $P = .05$)

*1 less than $8 \times 4 \times 4 \times 4 = 512$.

APPENDIX XXXIII.

NOTE ON SUBJECT No. 38, BY CAPTAIN A. C. AGGARWALA, B.Sc., HONS., M.R.C.V.S., A.I.R.O., OFFICER ON SPECIAL DUTY (ANIMAL HUSBANDRY), IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI.

The livestock population of India is the highest in the world, and it has been authoritatively stated by Col. A. Olver, C.B., C.M.G., F.R.C.V.S., the Animal Husbandry Expert to the Government of India, that the gross annual cash value of India's livestock and livestock products is not less than Rs. 2,000 crores. It is, however, disappointing to note from trade figures (*vide* Appendix I) that the value of exports of animals and animal products from India is surprisingly low. Although the figures of total value are more or less steady, a gradual decrease is noticeable in the numbers of live animals exported. The underlying reason is that nearly all foreign countries which previously imported Indian livestock and livestock products have promulgated stringent laws and enactments prohibiting such imports, particularly of livestock. This is done partly with a view to encourage their own indigenous stock-raising but it is mainly because India has not kept pace with international developments connected with the campaign against contagious diseases of animals and it is time that this country took steps to enable her to take her proper place in the federation of nations of the world in such matters.

An even economic balance, mutual understanding and assistance and concerted action for common well-being constitute the bases for the consolidation and strengthening of world peace, to ensure which every country and nation is so keen today. Economic isolation of any country is liable to lead her ultimately into economic explosion with simultaneous proportionate repercussion on economic conditions obtaining in other countries. In her present undeveloped and unorganised state of veterinary control, India is economically isolated, particularly in respect of her trade in livestock and livestock products, and her greatest potential wealth continues to remain unexploited to the great disadvantage of her masses whose main occupation is agriculture and stock-raising.

India has since long been merely 'producing' a large number of useless animals without making adequate arrangements for their housing, upkeep, feeding, veterinary supervision and ultimate disposal. Quality and discreet selective breeding have long been lamentably neglected. Her case to day bears close resemblance to the 'farmer who hangs himself' by the over production of unsaleable commodities of inferior quality.

A few of the wide-awake countries of the world, which have taken full advantage of modern scientific research in the field of livestock production, having been convinced that concerted action and closer and more frequent international co-operation are necessary for an unceasing and increasingly effective campaign against contagious diseases of animals, the development of international trade in livestock and animal products and the improvement of veterinary health conditions, have joined under the Economic Committee of the League of Nations and have formulated the following three International Conventions: (*vide* Appendix II).

I. International Convention for the Campaign against Contagious Diseases of Animals;

II. International Convention Concerning the Transit of Animals, Meat and Other Products of Animal Origin; and

III. International Convention Concerning the Export and Import of Animal Products (Other than Meat, Meat Preparations, Fresh Animal Products, Milk and Milk Products).

A study of the afore-mentioned three International Veterinary Conventions indicates that India, in her present undeveloped and unorganised state of veterinary control, is not in a position to join or adhere to the proposed conventions. The countries which have already signed these Conventions are comparatively smaller in size and have more efficient veterinary services by which contagious diseases of animals can be kept under control. India, on the contrary, is a sub-continent and possesses a very large number of animals. Her masses are generally poor and in a backward state. In order to comply with the undertakings demanded of the Contracting Parties provision for the fulfilment of the following main conditions in this country shall have to be made :—

International Convention No. I, relating to the Campaign Against Contagious Diseases of Animals.

- (1) Central legislative power should exist for the enactment of necessary legislation and for taking administrative measures to ensure joint and effective action against the outbreak and spread of contagious diseases amongst animals throughout India.
- (2) An official veterinary health organisation should be established and maintained throughout India to ensure the execution of the measures enunciated in such legislation.
- (3) There should be a Veterinary Chief for the whole of India directly responsible to a competent Minister of State.
- (4) The veterinary health services of India should be more fully organised and the number of veterinary officers available should be considerably increased to deal competently with the huge number of animals concerned.
- (5) Government veterinary officials should be required to hold diplomas in veterinary medicine and surgery of a considerably higher standard than at present, which would be acceptable to other Contracting Parties.
- (6) An organisation should be created for publishing regularly a veterinary health report twice monthly, furnishing statistical information regarding the incidence of the major epizootic diseases of animals and for giving immediate notification of outbreaks of such diseases and their distribution to other Members of the Confederation.

International Convention No. II, concerning the Transit of Animals, Meat and Other Products of Animal Origin.

Regarding this India is not at present much concerned except for its own protection at the important frontiers. Transit of Animals, Meat and Other Products of Animal Origin through India to other countries hardly exists.

International Convention No. III, concerning the Export and Import of Animal Products (Other than Meat, Meat Preparations, fresh Animal Products, Milk and Milk Products).

In regard to this India would be required to undertake to admit to free traffic from other countries concerned in the Convention, such articles as hides, horns, bones, wool or offal, provided that they have undergone any treatment recognised as adequate from the point of veterinary prophylaxis by the International Office of Epizootic Diseases; special provision, however, being made when Cattle plague, swine fever, foot-and-mouth disease, sheep-pox and anthrax exists. For the fulfilment of obligations under this Convention a much more fully organised veterinary service than exists at present would also be required, capable of dealing with such matters for India as a whole. The case of Germany may be cited in instance. In that country the different States of the Reich are responsible for Campaign Against Epizootic Diseases, but in order to ensure uniform execution of the obligations arising out of the provisions agreed upon, all communications to be addressed to Germany should be sent to the Reich Ministry of the Interior. A somewhat similar organisation would be necessary for India, as it would otherwise be impossible for other Members of the Convention to deal direct with each province or State.

APPEN

A. Statement showing quantity and values of imports of animals and animal products

Description of article.	Quantity.			
	1931-32.	1932-33.	1933-34.	1934-35.
1. Live Animals—				
Horses No.	4,962	1,970	3,097	3,061
Other Animals . . . "	7,057	2,572	2,664	6,360
Total	12,019	4,542	6,361	9,421
2. Hides and Skins—				
Hides Raw . . . Tons	779	702	869	650
Skins Raw "	1,033	1,069	1,853	1,361
Total Raw Hides and Skins .	1,812	1,771	2,222	2,011
Leather—Tanned Hides . Tons.	46	34	14	11
Leather—Tanned Skins . . "	65	122	166	188
Total Tanned Hides and Skins.	111	156	180	199
Unwrought Leather . . Cwts.	4,319	4,049	10,556	22,843
Total Hides and Skins . .	...	...	...	...
3. Finished Leather goods—				
Boots and shoes (all leather) Pcs.	244,072	424,910	349,030	351,673
Leather Belting for Machinery . . . "	...	...	...	...
Bags and Trunks . . . Cwt.	216	211	447	714
Pickers "	2,953	3,382	3,342	4,092
Picking Bands and Straps . . "	3,426	3,803	3,182	3,780
Roller Skins "	755	629	551	716
Saddlery and Harness . . . "	159	129	77	122
Other sorts "	21,429	28,307	13,390	15,617
Total . . . . .	...	...	...	...
4. Wool and Woollen Products—				
Raw Wool lbs.	6,890,936	7,186,377	5,093,862	5,985,124
Knitting Wool "	739,170	995,775	809,988	1,853,144
Worsted Yarn for Weaving . . "	507,026	911,974	890,605	1,038,438
Blankets and rugs "	2,411,373	4,177,079	5,119,678	6,065,145
Brads "	7,824	15,717	11,513	29,849
Carpets and floor rugs "	267,013	137,314	135,036	160,574
Hosiery "	157,387	265,835	281,136	408,533
Piecegoods Yards	5,515,554	13,049,781	11,535,913	10,510,030
Shawls No.	163,890	333,291	331,615	415,983
Knitted Apparel . . . lbs.	...	...	...	...
Total . . . . .	...	...	...	...
5. Dairy Products—				
Butter Cwts.	3,570	3,772	5,106	6,255
Cheese "	7,340	8,868	9,871	10,924
Milk foods, etc. "	11,844	10,317	12,027	9,174
Milk condensed and pre-served "	185,925	172,332	171,870	180,942
Ghi "	2,415	456	270	339
Total . . . . .	...	...	...	...
6. Other Animal Products—				
Animal Oils Gals.	247,287	1,087,110	860,701	...
Fish, Canned Cwts.	19,897	23,873	26,593	46,750
Fish, Excluding Canned . . . "	87,883	92,975	102,009	96,972
Isinglass "	441	1,002	399	880
Bacon and Hams "	11,057	11,922	15,284	15,888
Cod Liver Oil lbs.	70,570	127,040	115,521	99,106
Fish Manures Tons.	3,745	1,675	1,007	1,143
Hair Cwts.	1,369	1,320	1,558	1,855
Manufactures of hair . . . "	...	...	...	...
Lard Cwts.	403	550	1,009	784
Total . . . . .	...	...	...	...
GRAND TOTAL . . . .	...	...	...	...

ous kinds for the five years 1931-32 to 1935-36.

	Value.				
1935-36.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.
	Rs.	Rs.	Rs.	Rs.	Rs.
2,338	40,10,053	12,89,025	26,51,052	23,15,501	18,17,852
6,820	1,06,104	1,80,190	1,60,346	1,78,340	2,20,703
9,158	42,08,157	14,79,121	28,12,298	24,03,841	20,38,557
559	4,39,318	2,40,382	2,95,592	2,29,708	2,13,710
1,308	10,03,409	6,12,681	8,95,053	8,07,327	7,86,051
1,027	14,42,727	8,62,063	11,01,245	10,37,035	10,00,361
3	1,48,606	1,58,462	61,054	49,030	49,179
136	7,07,600	12,78,031	13,06,582	14,55,784	11,03,292
198	9,40,200	14,30,493	13,08,536	16,05,414	11,52,471
23,958	4,58,003	3,06,812	3,07,787	4,80,033	8,13,049
...	28,40,990	20,05,108	29,27,568	25,90,512	29,06,481
369,749	11,06,762	14,22,009	12,15,051	12,05,202	12,22,557
...	26,05,863	26,08,714	22,86,067	24,59,717	24,71,798
346	95,714	72,151	1,35,238	1,42,156	1,25,210
4,503	4,01,313	5,02,056	4,00,379	0,11,039	0,85,002
4,268	7,18,061	8,13,116	6,61,526	7,85,828	8,55,137
860	7,12,244	5,08,717	5,02,664	5,96,471	6,06,316
91	93,887	41,543	35,334	66,077	37,520
19,198	6,84,059	7,33,070	6,07,047	6,91,216	6,84,014
...	64,89,103	67,62,036	59,37,406	65,58,696	67,48,454
7,485,249	31,00,449	42,12,188	34,00,570	41,35,017	44,10,193
1,038,579	14,08,513	17,00,358	13,44,011	31,50,817	17,32,190
1,086,107	9,03,928	15,12,003	12,17,895	28,50,098	18,26,576
4,618,205	18,74,846	23,07,222	40,02,294	54,08,736	35,12,792
8,040	22,085	43,300	28,372	30,359	22,007
201,742	5,10,115	4,02,273	2,35,297	3,41,712	3,02,012
...	0,69,114	0,02,601	8,82,362	12,25,854	...
5,259,596	68,74,776	1,01,12,515	1,30,20,788	1,39,82,375	81,09,065
500,259	5,04,320	10,83,061	9,48,147	11,96,519	11,46,114
485,604	...	...	...	...	11,10,567
...	1,69,74,040	2,92,53,300	2,50,04,705	3,24,49,987	2,22,42,116
7,708	5,42,897	5,23,500	5,78,346	6,23,654	6,05,706
10,540	6,33,457	7,61,151	8,07,208	8,43,392	7,64,438
10,895	28,04,218	18,89,098	10,41,497	13,67,711	16,50,917
209,214	57,82,702	49,10,100	45,51,052	48,30,070	54,21,165
371	1,31,557	25,050	14,621	14,911	10,430
...	93,44,331	81,08,908	75,02,784	70,80,644	85,48,608
46,087	2,07,328	11,37,101	7,93,501	3,77,238	3,90,014
110,102	7,23,182	8,74,093	8,51,116	10,80,623	14,10,801
591	18,42,102	13,66,234	15,05,129	10,50,845	10,34,212
17,080	1,02,441	1,54,718	48,483	1,01,264	82,022
100,431	9,03,815	9,12,325	12,28,980	11,48,032	12,30,255
2,479	30,122	65,063	57,691	46,340	45,435
2,179	1,51,319	1,20,080	60,888	92,746	1,12,846
...	38,044	20,357	34,970	42,806	50,281
695	3,198	11,350	19,347	24,067	32,463
...	18,070	19,479	38,820	31,590	38,047
...	36,45,687	47,00,030	40,38,670	46,01,514	43,40,170
...	4,24,50,820	5,29,08,568	4,00,03,401	5,63,81,101	4,78,90,452

B. Statement showing quantity and values of exports of animals and animal products

Description of articles.	Quantity.			
	1931-32.	1932-33.	1933-34.	1934-35.
1. Animals—				
Cattle No.	756	948	779	778
Horses "	2	32	53	69
Sheep and Goats "	67,533	39,080	40,420	47,388
Other Animals "	116,040	46,978	92,021	119,510
Total				
2. Hides and Skins—				
Buffalo Hides Raw . . . Tons.	2,702	1,563	2,947	2,838
Cow Hides Raw "	13,570	11,439	10,806	10,271
Calf Skins "	347	343	451	480
Other Hides "	9	3	11	...
Goat Skins Raw "	15,613	12,152	13,183	13,873
Sheep Skins Raw "	520	636	1,244	1,175
Cuttings of Hides and Skins "	474	610	1,446	1,904
Raw skins other than of Goats, Sheep, etc. "	331	528	462	110
Total Raw				
Hides Tanned or dressed "	10,300	9,036	13,156	11,370
Skins Tanned or dressed "	5,494	5,483	6,566	6,546
Total Tanned				
Unwrought Leather "	2,703	5,136	8,993	12,128
Total Hides and Skin				
3. Finished leather goods—				
4. Wool—				
Raw Wool lbs.	41,265,157	32,248,819	55,864,599	34,075,204
Carpets and rugs "	4,766,797	5,963,304	8,452,443	10,063,364
Piecegoods Yds.	3,038	90,314	4,489	60,542
Shawls Nos.	32,257	7,128	4,860	9,662
Other Manufactures lbs.	208,555	226,900	159,181	149,073
Total				
5. Dairy Product—				
Butter Cwts.	2,870	2,241	1,911	1,896
Cheese "	54	34	29	29
Ghee "	27,294	21,837	24,418	25,526
Total				
6. Other Products—				
Bones for Manufacturing. Tons.	46,117	38,565	39,101	52,376
Bones for Manure. "	4,685	3,117	4,293	8,365
Bonemeal "	33,093	18,446	20,556	28,106
Caseln Cwts.	5,815	7,805	8,209	7,552
Fish, dry, salted "	140,802	92,344	129,208	135,249
Fish, dry, unsalted "	92,607	114,273	92,331	66,746
Fishmaws and Sharkfins "	7,503	7,203	7,331	7,370
Fish Manures Tons.	9,624	6,729	10,261	11,027
Guanos "	5,624	3,158	4,651	5,164
Horn Tips and pieces of horn Cwts.	22	6	2,346	1,219
Lard "	13,143	35,043	41,705	34,621
Total				
GRAND TOTAL				

DIX I.

of various kinds for the five years 1931-32 to 1935-36.

Value.					
1935-36.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.
	Rs.	Rs.	Rs.	Rs.	Rs.
407	84,963	82,059	72,103	61,771	41,905
28	1,500	64,000	50,050	2,10,220	32,400
39,013	12,77,509	7,78,053	7,83,015	8,30,428	7,23,472
227,689	1,34,878	85,334	78,475	1,00,810	1,38,421
	14,08,848	10,10,064	9,85,673	12,21,278	9,30,198
2,093	13,05,804	6,32,024	12,35,103	11,61,500	10,64,413
10,462	70,01,021	54,35,108	86,55,696	95,59,031	98,12,644
522	2,40,955	1,02,717	2,41,051	2,30,321	3,39,338
...	1,578	460	1,610	...	510
20,108	2,58,10,431	1,78,05,818	2,70,05,088	1,80,72,901	2,78,31,671
938	5,07,008	5,27,050	11,33,083	15,71,812	14,31,710
4,936	40,023	61,131	75,800	1,00,182	3,01,497
164	9,03,441	29,72,302	35,24,741	6,01,813	6,27,889
	9,03,71,421	2,70,86,085	3,47,42,007	3,13,06,743	4,13,09,565
14,090	2,12,05,518	1,02,11,726	2,40,80,141	1,07,63,385	2,29,06,303
6,275	3,13,08,098	3,04,21,496	3,23,76,610	3,21,50,744	2,91,10,870
	5,26,34,516	4,00,33,222	5,04,50,751	5,22,14,120	5,20,17,233
17,760	5,73,511	8,28,721	15,39,837	21,04,830	34,81,750
	8,97,70,478	7,44,02,778	9,27,39,055	8,57,15,702	9,08,03,551
	3,11,038	1,70,768	3,02,235	3,70,369	7,00,223
49,862,285	2,77,24,010	1,00,92,045	1,98,37,511	1,27,49,752	2,09,66,129
9,847,108	50,72,510	93,50,805	72,05,760	89,81,365	89,04,038
20,820	7,223	2,13,004	13,240	89,531	34,470
21,842	68,288	22,202	28,306	37,910	70,600
26,704	2,10,581	1,04,855	91,196	77,905	1,14,114
	3,80,78,405	1,77,73,431	2,72,37,063	2,10,27,303	2,95,25,851
2,289	3,02,805	2,26,373	1,77,436	1,71,965	2,04,378
31	4,002	2,770	2,180	2,493	2,601
24,030	22,20,714	15,90,328	13,31,077	14,04,001	14,02,074
	25,33,521	18,19,471	15,10,093	10,35,461	17,01,053
53,103	45,18,792	34,82,237	21,37,912	31,05,545	32,10,484
14,418	4,04,023	2,81,154	3,39,074	5,92,467	10,05,344
29,476	18,20,187	10,08,103	11,12,106	14,31,169	18,94,100
11,452	60,371	72,263	1,55,530	1,55,531	2,24,672
1,47,104	28,07,025	19,49,210	23,30,715	23,04,411	24,11,789
1,05,781	16,75,280	17,02,708	18,01,709	14,50,715	14,04,007
0,344	8,18,036	7,50,439	6,01,132	6,00,185	5,80,237
8,196	61,217	67,200	65,406	89,023	61,727
0,195	5,46,750	2,40,880	3,25,037	3,80,002	4,35,112
189	2,634	000	1,50,594	97,772	8,214
37,237	1,85,842	2,48,200	3,21,513	2,47,377	2,82,347
...	...	...	...	150	...
	1,80,02,911	99,69,102	93,24,026	1,05,53,387	1,11,28,033
	14,07,98,861	10,61,54,680	18,20,99,345	12,14,38,660	14,08,00,809

APPENDIX II.

INTERNATIONAL CONVENTIONS—LEAGUE OF NATIONS.

CONVENTION I.

International Convention for the Campaign against Contagious Diseases of Animals.

Being convinced that an unceasing and increasingly effective campaign against contagious diseases of animals can only be successfully prosecuted by concerted action by the countries concerned;

Recognising unanimously, moreover, that, in any action intended to facilitate international trade in live-stock and animal products, the first item in the programme must be the improvement of veterinary health conditions by every possible means, including closer and more frequent international co-operation;

Have appointed as their Plenipotentiaries :

Who, having communicated their full powers, found in good and due form, have agreed upon the following provisions .

Article 1.

The High Contracting Parties undertake to enact the necessary legislation and take the necessary administrative measures for ensuring joint and effective action against the appearance and spread of contagious diseases of animals.

These measures should more particularly provide for :

- (1) Control over farm animals and over establishments which are of special importance in the campaign against animal diseases, such as slaughter-houses, knackers' yards, cattle and meat markets, fattening establishments, dairies, the stables of inns, traders and relay stations, establishments utilising animal products; supervision over the production of and trade in sera, viruses and microbe cultures, whether attenuated or not, and biological diagnostic products; supervision over the means of transport and of loading and unloading places and quarantine stations;
- (2) The discovery of any outbreak of contagious disease of animals, together with an indication of the areas infected;
- (3) The methods of preventing and dealing with contagious diseases of animals;
- (4) The regulation of transport in all its forms, and particularly with a view to the disinfection of vehicles;
- (5) The penalties to be imposed in the event of an infringement of the measures enacted.

Article 2.

The High Contracting Parties undertake to establish and maintain in their respective countries, where not already existing, an official veterinary health organisation to ensure the execution of the measures referred to in Article 1. In principle, this official organisation should comprise :

- (1) A Government veterinary health service, the chief functions of which would be :
 - (a) To supervise the places and establishments referred to in Article 1 for the purpose of ascertaining the outbreak and development of contagious diseases of animals;
 - (b) To apply the measures concerning contagious diseases of animals, as well as measures for preventing and combating these diseases;
 - (c) To inspect animals and animal products;
 - (d) To issue certificates regarding the origin and health of animals and the origin and soundness of animal products;
- (2) Teaching and research institutions for the training of the personnel of veterinary health services; scientific laboratories necessary for the satisfactory working of these services.

Article 3.

The High Contracting Parties undertake to organise their respective veterinary health services on the principles specified hereinafter and recognised as essential for the proper organisation of a veterinary service :

(1) The Government veterinary health service should be under the authority of a chief veterinary officer directly responsible to the competent Minister.

(2) The number and the duties of Government veterinary officers and of veterinary surgeons approved by the State for certain official duties should, regard being had to the extent of stock-breeding, the area of land under cultivation, and the whole territory, which should be divided up into definite geographical sanitary districts, as well as of all the domestic animals.

This veterinary health service should enable the State to determine the origin and, so far as scientific knowledge permits, the state of health of animals and the soundness of animal products intended for export. The personnel should be in proportion to the quantity of live-stock to be supervised.

(3) Government veterinary officers or veterinary surgeons approved for certain duties should hold a State diploma in veterinary medicine or a diploma recognised by the State.

Only veterinary surgeons who are employed and paid by the State may be regarded as Government veterinary officers.

In exceptional cases, other veterinary surgeons may be entrusted with certain duties provided that the State is responsible for any action they may take.

(4) Veterinary inspection at the frontiers should be carried out only by Government veterinary officers or veterinary surgeons approved by the State for that purpose.

(5) (a) In principle, the inspection of meat intended for sale and public consumption must be entrusted to approved veterinary surgeons placed under the supervision of the Government veterinary service.

(b) Veterinary health inspection of meat and meat preparations intended for export must be carried out by Government veterinary officers or veterinary surgeons approved by the State for that purpose.

Article 4.

The existence of a veterinary health organisation in conformity with the provisions of Articles 2 and 3 shall be notified by each of the High Contracting Parties by means of a memorandum, summarising the main features of the organisation and forwarded, at latest at the moment of depositing the ratification of the Convention, to the Secretary-General of the League of Nations, who will notify the other High Contracting Parties thereof.

Article 5.

The High Contracting Parties undertake on the basis of the recommendations of the International Office for Contagious Diseases of Animals to publish regularly a veterinary health bulletin in accordance with the rules laid down below :

(1) The veterinary health bulletins should be published on the 1st and 15th of each month and give all information for the previous fortnight.

(2) They should be exchanged between the central veterinary authorities without recourse to diplomatic channels.

(3) They should give all statistical information regarding the following diseases : cattle plague (*pestis bovum*), foot-and-mouth disease (*Aphthae epizooticae*), contagious peri-pneumonia (*Pleuro-pneumonia bovum contagiosa*), anthrax fever (*Anthrax*), sheep-pox (*Variola ovium*), rabies, glanders (*Malleus*), dourine (*Exanthema coitale paralyticum*), swine fever (*Pestis suum*).

(4) Each country may also give statistical or other information regarding other diseases.

The veterinary health bulletins should necessarily indicate the veterinary health situation on the date of publication, i.e.; the number and names of the large territorial divisions (provinces, departments, districts), the number of communes and premises infected at the date on which the bulletin is published, and the number of communes and premises which have become infected during the period under consideration.

Article 6.

When an outbreak of cattle plague, swine fever or fowl plague, foot-and-mouth disease, rabies, contagious peri-pneumonia of bovines or dourine is first discovered in the territory of one of the High Contracting Parties, the central veterinary authorities of the other High Contracting Parties must immediately be notified by the chief of the veterinary service of the outbreak of the disease and the position of the various infected centres. Such notification shall be made by telegraph or wireless to all contiguous States and in all cases in which an exchange of animals or animal products takes place between the High Contracting Parties.

The High Contracting Parties further undertake to require their veterinary health authorities of the first instance who are posted at the frontier to notify directly and without delay the corresponding authorities of the other neighbouring High Contracting Parties of the outbreak and extent of the diseases mentioned in the above paragraph and, in addition, of the outbreak and extent of sheep-pox, glanders, and fowl cholera. Such communications must in all urgent cases be made by telegraph without prejudice to the special provisions arising out of bilateral agreements in force between any of the High Contracting Parties.

Article 7.

The High Contracting Parties undertake to give favourable consideration to :—

- (a) The admission of students, professors, lecturers and assistants of the countries of the other High Contracting Parties to the institutions and laboratories of their countries;
- (b) Temporary exchanges of veterinary officers between their various administrations;
- (c) The permanent or temporary establishment of veterinary officers of one High Contracting Party in the territory of another if, in view of the special relations between the countries concerned, substantial advantages might be derived therefrom;
- (d) The organisation of missions for study composed of veterinary officers of one or more of the High Contracting Parties for the purpose of enquiring into the research work or methods pursued in one or other of the countries of the High Contracting Parties, and, on the request of one of the High Contracting Parties to negotiate direct on such questions.

Article 8.

The High Contracting Parties recognise the right of the chiefs of veterinary health services to communicate with one another direct, when difficulties of a veterinary nature arise in connection with the trade in animals and animal products. Copies of all such communications shall be forwarded through diplomatic channels.

The High Contracting Parties undertake to require the chiefs of their veterinary health services to get into touch with the corresponding chiefs of another High Contracting Party if serious difficulties should arise in connection with the trade in live-stock or animal products with such country.

FINAL PROVISIONS.

Article 9 (Settlement of Disputes).

1. If there should arise between the High Contracting Parties a dispute of any kind relating to the interpretation or application of the present Convention, and if such dispute cannot be satisfactorily settled by diplomacy, it shall be settled in accordance with any applicable agreements in force between the Parties providing for the settlement of international disputes.
2. In case there is no such agreement in force between the Parties, the dispute shall be referred to arbitration or judicial settlement. In the absence of agreement on the choice of another tribunal, the dispute shall, at the request of any one of the Parties, be referred to the Permanent Court of International Justice if all the Parties to the dispute are Parties to the Protocol of December 16th, 1920, relating to the Statute of that Court and, if any of the Parties to the dispute is not a Party to the Protocol of December 16th, 1920, to an arbitral tribunal constituted in accordance with the Hague Convention of October 18th, 1907, for the Pacific Settlement of International Disputes.

Article 10 (Languages and Date).

The present Convention, of which the English and French texts are both authoritative, shall bear this day's date.

Article 11 (Signature and Ratification).

1. The present Convention may be signed until February 15th, 1936, on behalf of any Member of the League of Nations or any non-member State to which the Council of the League of Nations shall have communicated a copy of the present Convention for the purpose.

2. The present Convention shall be ratified. The instruments of ratification shall be deposited with the Secretary-General of the League of Nations, who will notify the deposit thereof to all the Members of the League of Nations and to the non-member States referred to in the preceding paragraph.

Article 12 (Accession).

1. On and after February 16th, 1936, any Member of the League of Nations and any non-member State to which the Council of the League of Nations shall have communicated a copy of the present Convention may accede to it.

2. The instruments of accession shall be deposited with the Secretary-General of the League of Nations, who will notify such deposit to all the Members of the League of Nations and to the non-member States referred to in the preceding paragraph.

Article 13 (Entry into Force).

1. The Secretary-General of the League of Nations will draw up a procès-verbal when five ratifications or accessions have been received.

2. A certified true copy of this procès-verbal shall be transmitted by the Secretary-General of the League of Nations to all Members of the League and to all non-member States mentioned in Article 11.

Article 14.

1. The present Convention shall be registered by the Secretary-General of the League of Nations ninety days after the date of the procès-verbal mentioned in Article 13. It will come into force on that date.

2. In respect of each Member or non-member State on whose behalf any instrument of ratification or accession is subsequently deposited, the Convention shall come into force ninety days after the date of the deposit of such instrument.

Article 15 (Duration and Denunciation).

1. The duration of the present Convention shall be for two years from its entry into force.

2. It shall remain in force for a further period of four years, and subsequently in respect of such Contracting Parties as have not denounced it at least six months before the expiry of the period.

3. The denunciation shall be effected by a written notification addressed to the Secretary-General of the League of Nations, who will inform all the Members of the League and the non-members States referred to in Article 11.

Article 16 (Application to Colonies, Protectorates, etc.).

1. In the absence of a contrary declaration by one of the High Contracting Parties at the time of signature, ratification or accession, the provisions of the present Convention shall not apply to colonies, protectorates, overseas territories, territories under its suzerainty or territories in respect of which a mandate has been entrusted to it.

2. Nevertheless, the High Contracting Parties reserve the right to sign the Convention or to accede thereto, in accordance with the provisions of Articles 11 and 12, for their colonies, protectorates, overseas territories, territories under their suzerainty or territories in respect of which a mandate has been entrusted to them.

3. They further reserve the right to denounce the Convention separately, in accordance with the provisions of Article 15.

Article 17 (Revision).

1. Conferences for the revision of the present Convention may be called with a view to making such changes therein as experience may have shown to be useful.

2. A Conference for the revision of the present Convention shall be called by the Secretary-General of the League of Nations whenever so requested by not less than five of the High Contracting Parties.

The latter shall indicate succinctly the changes they propose and the reasons for such changes.

3. In default of the unanimous consent of the High Contracting Parties, no demand for the calling of a conference for the revision of the present Convention within less than two years from the entry into force of the Convention or four years from the end of a previous Conference for its revision shall be admissible.

4. The Secretary-General of the League of Nations shall prepare the work of conferences for the revision of the present Convention with the co-operation of the International Office for Contagious Diseases of Animals.

In Faith Whereof the above-mentioned Plenipotentiaries have signed the present Convention.

Done at Geneva on the twentieth day of February, one thousand nine hundred and thirty-five, in a single copy, which shall be kept in the archives of the Secretariat of the League of Nations, and of which a certified true copy shall be delivered to the Members of the League and to the non-member States referred to in Article 11.

BULGARIA

N. Antonoff

FRANCE.

V. Drouin.

ITALY.

C. Bisanti.

LATVIA.

J. Feldmans.

THE NETHERLANDS.

Pour le Royaume en Europe¹

C. Van Rappard.

POLAND.

Titus Komarnicki.

ROUMANIA.

C. Antoniadé.

SWITZERLAND.

Flückiger.

CZECHOSLOVAKIA.

Rodolphe Künzl-Jizersky.

Certified true Copy.

*For the Secretary-General;
Legal Adviser of the Secretariat*

¹Translation:—For the Kingdom in Europe.

DECLARATION ATTACHED.

In proceeding to the signature of the International Convention for the Campaign against Contagious Diseases of Animals, dated February 20th, 1935, the undersigned declare on behalf of their respective Governments that they regard the Government Veterinary Health Service as at present organised in Italy as complying, as an exceptional case, with the requirements of Article 3, paragraph (1), of the said Convention.

In Faith Whereof the undersigned have signed the present Declaration.

Done at Geneva on the twentieth day of February, one thousand nine hundred and thirty-five in a single copy, which shall be kept in the archives of the Secretariat of the League of Nations, and of which a certified true copy shall be delivered to all the Members of the League and to the non-member States referred to in Article 11.

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Certified true copy.

*For the Secretary-General,
Legal Adviser of the Secretariat.*

CONVENTION II.

International Convention Concerning the Transit of Animals, Meat and Other Products of Animal Origin.

Being convinced that it is both desirable and necessary to establish a fair balance between the health-interests of transit countries, on the one hand, and the legitimate desires of the international trade in animals, meat and other products of animal origin;

Being desirous, on the other hand, of affording the transit of animals, meat and other products of animal origin the fullest measure of freedom consistent with the requirements of veterinary health inspections and public health;

Have appointed as their Plenipotentiaries:

Who having communicated their full powers, found in good and due form, have agreed upon the following provisions:

Article 1.

1. The High Contracting Parties undertake to permit the transit of cattle, horses, asses, mules, etc., pigs, sheep, goats, poultry, and all animal products originating in countries Parties to the International Convention for the Campaign against Contagious Diseases of Animals.

2. The transit of the animals to which paragraph 1. above relates shall be subject to previous notification of the consignments, to the veterinary authority designated by the transit country for that purpose, and shall be carried out under the conditions laid down in the articles hereinafter following, due regard being had to the following provisions of the present article.

No notification shall be required for the transit of the animal products to which paragraph 1. above relates.

3. The existence of cattle plague in the country of origin justifies absolute refusal of transit.

The discovery of swine fever, foot-and-mouth disease, sheep-pox or contagious peri-pneumonia of bovines may justify refusal by the transit countries of the transit of animals susceptible to these diseases, regard being given to the number and position of the centres of infection in the country of origin.

4. In the case of an outbreak of cattle plague in the country of origin, the transit of meat and animal products derived from the various species of ruminants may be prohibited.

5. Transit may in no case be refused for animals and products originating in countries with which the transit country has—at the time the request for transit is made—an import trade in animals and animal products of the same kind.

Article 2.

1. In order to be allowed to pass in transit a certificate of origin and health must accompany the animals: this certificate, drawn up in accordance with the principles laid down by the International Office for Contagious Diseases of Animals, shall conform to the specimen attached to the present Convention.

2. Certificates may be drawn up in the language of either the exporting or the importing country. The veterinary authorities of the transit country shall be entitled to demand a translation in case of doubt as to the contents of the document.

Article 3.

In principle, animals may only be transported in wagons constructed to prevent the escape or dissemination of excreta and other materials liable to transmit infection. Such animals should at any rate only be conveyed in wagons so constructed as to reduce the dissemination of infectious materials to a minimum.

Article 4.

1. The transit of live cattle, horses, asses, mules, etc., pigs, sheep, goats and poultry shall be effected through Customs offices and ports of landing open to traffic of this character. The transit country is entitled to inspect the sanitary condition of the animals passing in transit, check their certificate of origin and health and endorse it accordingly.

2. Except where there is a permanent inspection service at the point of entry selected, the competent veterinary officers for frontier inspection must be given due notice—not later than twenty-four hours before their arrival—of consignments of animals in transit as well as of the number of such animals.

3. Consignments which do not comply with the conditions laid down in Article 2, as well as consignments of animals found by the frontier veterinary surgeons to be affected with, or suspected of, a contagious disease and consignments of animals which have been conveyed with or been in contact with affected or suspected animals may be refused admittance at the frontier station of entry of the first transit country. The reason for refusal must be stated in the accompanying papers.

4. If the frontier veterinary surgeons of the successive transit countries find that consignments of animals are affected with, or suspected of, a contagious disease, the consignments shall be dealt with in the manner referred to in Article 6, paragraph 2, if the frontier veterinary surgeons of the first transit country found that it was healthy, and provided that this fact was noted and mentioned on the certificates of origin and health.

Article 5.

Animals in transit may only be unloaded with the permission and under the control of Government veterinary officer of the transit country or a veterinary surgeon duly authorised for the purpose by the State. They may only be watered, fed, cleaned, or subjected to any treatment in the wagons themselves under veterinary control and subject to the so-called "chain sealing" system or any other system offering similar guarantees.

With a view to meeting the various difficulties arising in the course of transit, the exporting countries shall take steps to see that the animals are properly loaded and suitably fed and that they receive all necessary attention, in order to avoid unnecessary suffering.

Annex to Article 5.

The High Contracting Parties shall take all necessary measures to avoid overloading. In the loading of ruminants and pigs, the floors of the transporting vehicles shall be covered with proper litter.

Consignments of live animals which are not transported in properly closed portable containers (baskets, boxes, cages, etc.), must be accompanied by a person in charge on long journeys. The latter must not be in charge of a greater number of animals than he can look after.

Transports of live animals must be sent by the quickest route, and as far as possible, by specially accelerated goods trains.

Article 6.

1. The High Contracting Parties, through whose territory the transit is to be effected may make the transit subject to a previous undertaking by the country of destination or other transit countries to admit such animals unconditionally.

2. If cattle plague, swine fever, fowl plague, foot-and-mouth disease or contagious peri-pneumonia of cattle is discovered, the transit countries may, at the forwarder's expense slaughter the infected consignments. In such cases, the circumstances must be clearly stated in a report drawn up by the veterinary officers who took part in the inspection. If there is a veterinary representative of the country of origin in the transit country, he shall be immediately notified in order that he may be present at the slaughter. A copy of the report must be sent to the central veterinary authority of the country of origin by the central veterinary authority of the transit country concerned.

Article 7.

Meat, fresh, chilled, frozen or preserved in a fresh state otherwise than by cold, as well as meat preparations, must, in order to be allowed to pass in transit, be accompanied by a certificate of origin and of freedom from contamination drawn up in accordance with the provisions of Article 2, paragraph 2.

Article 8.

1. Meat shall be conveyed in transit by rail in wagons closed and sealed by the Customs authorities, or by boat in isolated compartments, closed and sealed by the Customs authorities.

2. Meat preparation and pork-butchers' wares may also be conveyed in transit in closed packages or cases.

3. Wagons used for the transit of fresh meat must have impermeable floors.

4. As regards the transit of the meat and meat preparations referred to in Article 7, the High Contracting Parties undertake to confine frontier inspection to a simple examination of the certificates. Wagons will usually only be opened if the Customs authorities concerned consider this necessary in order to check the contents.

5. The High Contracting Parties concerned will endeavour as far as possible to arrange for joint inspection of the certificates.

Article 9.

1. When the transit transport of meat to which Article 7 relates is to be effected through the territory of one or more of the High Contracting Parties and has as its destination the territory of one of the High Contracting Parties it shall not be subject to any previous authorisation.

2. If a consignment of meat referred to in Article 7 is refused by the country of destination, in respect of which the present Convention is in force, it shall rest with the latter to take such steps as it may consider desirable, other than turning back the consignment on to the territory of the last country of transit.

3. In the case of transit of meat to which Article 7 relates having as its destination a country in respect of which the present Convention is not in force, the High Contracting Parties may make the transit subject to a previous undertaking by the Country of destination to admit such meat unconditionally.

4. The same previous undertaking may be required from transit country in respect of which the present Convention is not in force.

Article 10.

The High Contracting Parties undertake to allow animal products other than those referred to in Article 7 to pass also in transit, provided that such products are accompanied when necessary, by the certificate referred to in that article.

Article 11.

The transit of meat and of all other animal products liable to carry infection shall be effected through Customs offices and ports of landing open to traffic of this kind. In selecting these, regard shall be had as far as possible to the legitimate interest of international trade.

Article 12.

The Customs offices and ports to which Articles 4 and 11 relate shall be equipped with installations to permit of sanitary duties being efficiently carried out.

Article 13.

Should the measure above referred to prove inadequate and should contagious disease be introduced into a country as a result of the transit of live animals, meat or animal products, the country so infected may, while the danger exists, refuse to allow transit from the countries from which the contagion was conveyed.

Article 14.

The High Contracting Parties undertake to notify one another without delay of all prohibitions and restrictions affecting the transit of live animals, meat and animal products, or the cancellation of such measures.

Article 15.

Nothing in the present Convention shall affect the provisions of any other Convention, Treaty or Agreement at any time concluded between any of the High Contracting Parties, under which more favourable treatment than that laid down in the present Convention for the Transit of Animals, Meat and Other Animal Products is, or may in the future be, granted for the transit of the said animals and products of another High Contracting Party.

FINAL PROVISIONS.

Article 16 (Settlement of Disputes):

1. If there should arise between the High Contracting Parties a dispute of any kind relating to the interpretation or application of the present Convention and, if such dispute cannot be satisfactorily settled by diplomacy, it shall be settled in accordance with any applicable agreements in force between the Parties providing for the settlement of international disputes.

2. In case there is no such agreement in force between the Parties, the dispute shall be referred to arbitration or judicial settlement. In the absence of agreement on the choice of another tribunal, the dispute shall, at the request of any one of the Parties, be referred to the Permanent Court of International Justice if all the Parties to the dispute are Parties to the Protocol of December 16th, 1920, relating to the Statute of that Court and if any of the Parties to the dispute is not a Party to the Protocol of December 16th, 1920, to an arbitral tribunal constituted in accordance with the Hague Convention of October 18th, 1907 for the Pacific Settlement of International Disputes.

Article 17 (Languages and Date).

The present Convention, of which the English and French texts are both authoritative, shall bear this day's date.

Article 18 (Signature and Ratification).

1. The present Convention may be signed until February 15th, 1936, on behalf of any Member of the League of Nations or any non-member State to which the Council of the League of Nations shall have communicated a copy of the present Convention for the purpose.

2. The present Convention shall be ratified. The instruments of ratification shall be deposited with the Secretary-General of the League of Nations.

3. The ratification shall not take effect unless the High Contracting Party is already bound by the International Convention for the Campaign against Contagious Diseases of Animals by a ratification or a definitive accession and that Party's obligation under the same has already entered into force.

4. The Secretary-General of the League of Nations shall notify the deposit of the instruments of ratification to all Members of the League of Nations and to the non-member States referred to in paragraph 1 of the present article, at the same time stating whether the condition specified in paragraph 3 is fulfilled.

Article 19 (Accession).

1. On and after February 16th, 1936, any Member of the League of Nations and any non-member State to which the Council of the League of Nations shall have communicated a copy of the present Convention may accede to it.

2. The instruments of accession shall be deposited with the Secretary-General of the League of Nations.

3. Accession shall not take effect unless the High Contracting Party is already bound by the international Convention for the Campaign against Contagious Diseases of Animals by a ratification or a definitive accession, and that Party's obligation under the same has already entered into force.

4. The Secretary-General of the League of Nations shall notify the deposit of the instruments of accession to all Members of the League of Nations and to the non-member States referred to in paragraph 1 of the present article, at the same time stating whether the condition specified in paragraph 3 is fulfilled.

Article 20 (Entry into Force).

1. The Secretary-General of the League of Nations will draw up a procès-verbal when five ratifications or accessions complying with the condition laid down in paragraph 3 of Article 18 and in paragraph 3 of Article 19, have been received.

2. A certified true copy of this procès-verbal shall be transmitted by the Secretary-General of the League of Nations to all the Members of the League of Nations and to all non-member States mentioned in Article 18.

Article 21.

1. The present Convention shall be registered by the Secretary-General of the League of Nations ninety days after the date of the procès-verbal mentioned in Article 20. It will come into force on that date.

2. In respect of each Member or non-member State on whose behalf any instrument of ratification or accession is subsequently deposited, the Convention shall come into force ninety days after the date of the deposit of such instrument.

Article 22 (Duration and Denunciation).

1. The duration of the present Convention shall be for two years from its entry into force.

2. It shall remain in force for a further period of four years, and subsequently in respect of such Contracting Parties as have not denounced it at least six months before the expiry of the period.

3. The denunciation shall be effected by a written notification addressed to the Secretary-General of the League of Nations.

4. The present Convention shall cease to be in force as regards any High Contracting Party when as a result of denunciation of the International Convention for the Campaign against Contagious Diseases of Animals, the High Contracting Party has ceased, such denunciation having duly taken effect, to be a party to that Convention.

5. The Secretary-General of the League of Nations shall inform all Members of the League of Nations and non-member States referred to in paragraph 1 of Article 18 of all notices of denunciation of the present Convention or of the International Convention for the Campaign against Contagious Diseases of Animals, denunciation of the latter being counted as denunciation of the present Convention.

Article 23 (Application to Colonies, Protectorates, etc.).

1. In the absence of a contrary declaration by one of the High Contracting Parties at the time of signature, ratification or accession, the provisions of the present Convention shall not apply to colonies, protectorates, overseas territories, territories under its suzerainty or territories in respect of which a mandate has been entrusted to it.

2. Nevertheless, the High Contracting Parties reserve the right to sign the Convention or to accede thereto, in accordance with the provisions of Articles 18 and 19, for their colonies, protectorates, overseas territories, territories under their suzerainty or territories in respect of which a mandate has been entrusted to them.

3. They further reserve the right to denounce the Convention separately, in accordance with the provisions of Article 22.

4. The present Convention shall not be applicable to colonies, protectorates, overseas territories, territories under the suzerainty of a High Contracting Party or territories in respect of which a mandate has been entrusted to it if the International Convention for the Campaign against Contagious Diseases of Animals is not in force, or has ceased to be in force in so far as the said High Contracting Party is concerned, in the above-mentioned countries.

Article 24 (Revision).

1. Conferences for the revision of the present Convention may be called with a view to making such changes therein as experience may have shown to be useful.

2. A conference for the revision of the present Convention shall be called by the Secretary-General of the League of Nations whenever so requested by not less than five of the High Contracting Parties.

The latter shall indicate succinctly the changes they propose and the reasons for such changes.

3. In default of the unanimous consent of the High Contracting Parties, no demand for the calling of a conference for the revision of the present Convention within less than two years from the entry into force of the Convention or four years from the end of a previous conference for its revision shall be admissible.

4. The Secretary-General of the League of Nations shall prepare the work of conferences for the revision of the present Convention with the co-operation of the International Office for Contagious Diseases of Animals.

In Faith Whereof the above-mentioned Plenipotentiaries have signed the present Convention.

Done at Geneva the twentieth day of February, one thousand nine hundred and thirty-five in a single copy, which shall be kept in the archives of the Secretariat of the League of Nations and of which a certified true copy shall be delivered to all the Members of the League and to the non-member States referred to in Article 18.

BULGARIA.

N. Antonoff

FRANCE.

V. Drouin.

ITALY.

G. Bisanti.

LATVIA.

J. Feldmans.

THE NETHERLANDS.

Pour le Royaume en Europe¹

C. Van Rappard.

¹Translation:—For the Kingdom in Europe.

POLAND

Titus Komarnicki.

ROUMANIA

C. Antoniadu.

SWITZERLAND.

Flückiger.

CZECHOSLOVAKIA.

Le delegue de la Tchécoslovaquie declare, au moment de la signature de la Convention, que son Gouvernement n'estime pas pouvoir renoncer au droit de subordonner le transit des animaux a traverser son territoire a une autorisation préalable. Il declare en meme temps que son Gouvernement est decide a faire, dans la pratique, du droit qu'il se reserve, un usage aussi liberal que possible, en se conformant aux principes qui sont a la base de la presente convention destinee a faciliter le transit des animaux et des produits animaux.¹

Rodolphe Kunzl-Jizersky.

Certified true copy.

For the Secretary-General,

Legal Adviser of the Secretariat.

¹*Translation* :—The delegate of Czechoslovakia declares, at the moment of signing the Convention, that his Government does not consider that it can waive the right to make the transit of animals across its territory subject to a previous authorisation. He declares at the same time that his Government intends in practice to exercise the right so reserved in as liberal a spirit as possible, in conformity with the principles which are at the basis of the present Convention the object of which is to facilitate the transit of animals and of animal products.

ANNEX.

1. Specimen Certificate of Origin and Health.

I, the undersigned.....(name and qualification of the Government veterinary officer or veterinary surgeon in private practice approved by the State) certify the animal or animals hereinunder described, : and found them to be healthy and free from any contagious disease.

I, the undersigned, further certify that there has not been any case of contagious peri-pneumonia, foot-and-mouth disease, sheep-pox, swine fever or fowl plague for the last forty days either in the commune of origin or in neighbouring communes within a radius of twenty kilometers, or in the districts traversed on the way to the place of loading by rail or water.

Done at..... (date in words).

(Signature of veterinary surgeon, stating qualifications).

(Official stamp or seal.)

2. Specimen Certificate of Origin And Freedom From Contamination.

I, the undersigned (name and qualification of the Government veterinary officer of the State of provenance) certify that the animal products hereinafter described.....(weight)..... (nature of goods)marked as under :

consigned from (place of consignment).

by (name and address of consignor)

to (name and address of consignee)

in transport by (form of transport and, if transport is by water, name of vessel)

are entirely derived from animals submitted to veterinary inspection and found in healthy condition before and after slaughter, and contain no preservative substance, and have been prepared and consigned in accordance with the requirements of food hygiene.

Done at.....on (date in full).....

(Signature of veterinary surgeon, stating qualifications).

(Official Stamp or seal).

CONVENTION III.

International Convention concerning the Export and Import of Animal Products.
(Other than Meat, Meat preparations, fresh Animal Products, Milk and Milk Products).

Being desirous of affording the traffic in animal products (other than meat, meat preparations, fresh animal products, milk and milk products) the fullest measure of freedom compatible with the requirements of veterinary inspection and public health;

Have appointed as their Plenipotentiaries :

Who, having communicated their full powers, found in good and due form, have agreed upon the following provisions :—

Article 1.

The High Contracting Parties undertake to admit to free traffic such animal products (other than meat, meat preparations, fresh animal products, milk and milk products) as come from countries which have ratified the International Convention for the Campaign against Contagious Diseases of Animals and as are hereinafter specified :

- (a) Hides, dried or salted skins and dried, salted or limed hides for glue;
- (b) Horns, hoofs, claws, tusks, teeth either dried or having been subjected to a process of scalding, and without particles of soft matter adhering thereto;
- (c) Bones, dried or boiled; likewise without particles of soft matter adhering thereto, and bone-meal sterilised by steam under pressure;
- (d) Dried crude wool, woollen waste, wool from tanneries, dried hair of the various animals (bristles, horsehair) in a crude state, dried feather of every kind, provided that all such products are packed in sacks or covers;
- (e) Dried or salted guts, dried stomachs and bladders, packed in barrels or boxes, or made up in bales;
- (f) All products enumerated in the five previous paragraphs provided that they have undergone any other treatment recognised as adequate from the point of view of veterinary prophylaxis, by the High Contracting Parties concerned.

Nevertheless, as regards cattle plague, swine fever, foot-and-mouth disease, sheep-pox and anthrax the High Contracting Parties shall be entitled to make their traffic conditional upon the application of the provision hereinafter indicated.

Annex (to Article 1).

For the purposes of the present article, the terms "dried" and "salted" are exclusively applied to substances completely dried or completely saturated with salt.

Article 2.

Should cattle plague appear in the territory of one of the High Contracting Parties, the other High Contracting Parties shall have the right, as long as the danger of infection lasts, to prohibit the import of parts of animals and animal products which might convey infection.

Article 3.

If anthrax takes a malignant form or appears in numerous scattered centres, or if swine fever, foot-and-mouth disease or sheep-pox take a malignant or epidemic form in the territory of one of the High Contracting Parties, the other Parties may require that the animal products mentioned in Article 1 shall be accompanied, in order to be admitted on import, by a certificate of origin and freedom from contamination enabling the products to be identified in conformity with the specimen attached to the present Convention.

This certificate must be signed or countersigned by a Government veterinary official or by a veterinary surgeon duly authorised by the State to do so. It may only be issued if the origin and soundness of the products can be certified by veterinary inspection.

When anthrax or sheep-pox are prevalent in the country of origin, the High Contracting Parties may require that the animal products mentioned in Article 1, which may carry infection, be imported direct to establishments specially authorised for this purpose. The High Contracting Parties shall be entitled to lay down special provisions for the transport of the products to those establishments and their industrial use.

It shall be clearly understood that the measures described above must not be adopted in regard to countries in which anthrax is prevalent in a sporadic form.

Article 4.

In addition to the certificate of origin and freedom from contamination mentioned in the previous article, attestations may, in the case of a recrudescence of anthrax in the country of origin, be required on the importation of hides, skins, wool, hair bristles, bones and bone-meal. Such attestations shall indicate that these animal products have been subjected, under the responsibility of the exporting State and by methods recognised by the High Contracting Parties concerned to be of proved effectiveness, either to disinfection or to examination with a view to ascertaining the presence of disease. Special agreements regarding bones and bone-meal shall be necessary if treatment affording adequate guarantees that all anthrax germs have been destroyed appears to be impracticable.

The attestations issued must state very accurately the methods of disinfection or examination employed. They should also indicate the measures taken to prevent, after disinfection, re-infection during transport.

As regards completely salted skins and hides coming from public slaughter-houses under permanent veterinary supervision, it will be sufficient to produce the certificates of origin and freedom from contamination mentioned in Article 3.

Article 5.

When, as a result of the traffic in animals or animal products, an infectious disease (other than rabies, dourine, contagious peri-pneumonia of cattle and glanders), notification of which in the health bulletin is obligatory under the International Convention for the Campaign against Contagious Diseases of Animals of to-day's date, has been introduced from the territory of one of the High Contracting Parties into the territory of one of other Parties, the latter shall have the right, so long as the danger lasts, to prohibit the import of raw material of animal origin which might convey infection.

The High Contracting Parties shall have the same right in the event of one of the diseases mentioned in the preceding paragraph being prevalent in the territory of one of them.

Trade in industrially scoured wool shall be exempt from this provision.

Article 6.

In the case of goods covered by a collective sanitary attestation, the veterinary sanitary authorities of the ports, stations and warehouses may issue valid partial attestations to the same effect, to accompany re-shipments forming parts of a consignment.

It shall be open to the High Contracting Parties to require a certified copy of the collective sanitary attestation to be attached to the partial attestations.

Article 7.

Should the certificates of origin and freedom from contamination or the attestations provided for above not satisfy the requirements laid down in the preceding articles and thus not afford adequate guarantees, importing countries are authorised to refuse consignments at the frontier station, or to require either disinfection on import or examination with a view to ascertaining the presence of disease.

Article 8.

If one of the High Contracting Parties discovers that irregularities have occurred, on importation, in the issue of the necessary certificates or attestations, it may prohibit the importation of the products enumerated in Article 1, but it shall, at the same time inform the High Contracting Party or Parties concerned—country of origin, of provenance or of transit—in order that they may adopt measures and impose penalties to punish such abuses and prevent their recurrence. If the complainant High Contracting Party considers that the measures adopted by the country or countries concerned do not afford the guarantees that it considers necessary, it may continue to prohibit the importation of the products enumerated in Article 1, originating in or coming from the countries in question. It must nevertheless be prepared to take into consideration the proposals of the other High Contracting Party or Parties intended to allow of the resumption of this trade and to enter into negotiation with them on this subject.

Article 9.

Nothing in the present Convention shall affect the provisions of any other Convention, Treaty or Agreement concluded or to be concluded between any of the High Contracting Parties, under which more favourable treatment than that laid down in the present Convention for the export or import of the animal products enumerated in Article 1 is or may in the future be granted for the export or import of the said products of a High Contracting Party.

*FINAL PROVISIONS.**Article 10 (Settlement of Disputes).*

1. If there should arise between the High Contracting Parties a dispute of any kind relating to the interpretation or application of the present Convention and if such dispute cannot be satisfactorily settled by diplomacy, it shall be settled in accordance with any applicable agreements in force between the Parties providing for the settlement of international disputes.

2. In case there is no such agreement in force between the Parties, the dispute shall be referred to arbitration or judicial settlement. In the absence of agreement on the choice of another tribunal, the dispute shall, at the request of any one of the Parties, be referred to the Permanent Court of International Justice if all the Parties to the dispute are Parties to the Protocol of December 16th, 1920, relating to the Statute of that Court and, if any of the Parties to the dispute is not a Party to the Protocol of December 16th, 1920 to an arbitral tribunal constituted in accordance with the Hague Convention of October 18th, 1907, for the Pacific Settlement of International Disputes.

Article 11 (Languages and Date).

The present Convention, of which the English and French texts are both authoritative, shall bear this day's date.

Article 12 (Signature and Ratification)

1. The present Convention may be signed until February 15th, 1936, on behalf of any member of the League of Nations or any non-member State to which the Council of the League of Nations shall have communicated a copy of the present Convention for the purpose.

2. The present Convention shall be ratified. The instruments of ratification shall be deposited with the Secretary-General of the League of Nations.

3. The ratification shall not take effect, unless the High Contracting Party is already bound by the International Convention for the Campaign against Contagious Diseases of Animals by a ratification or a definitive accession, and his obligation under the same has already entered into force.

4. The Secretary-General of the League of Nations shall notify the deposit of the instruments of ratification to all members of the League of Nations and to the non-member States referred to in paragraph 1 of the present Article, at the same time stating whether the condition specified in paragraph 3 is fulfilled.

Article 13 (Accession).

1. On and after February 16th, 1936, any Member of the League of Nations and any non-member State to which the Council of the League of Nations shall have communicated a copy of the present Convention may adhere to it.

2. The instruments of accession shall be deposited with the Secretary General of the League of Nations.

3. Accession shall not take effect unless the High Contracting Party is already bound by the International Convention for the Campaign against Contagious Diseases of Animals by a ratification or a definitive accession and his obligation under the same has already entered into force.

4. The Secretary-General of the League of Nations shall notify the deposit of the instruments of accession to all Members of the League of Nations and to the non-member States referred to in paragraph 1 of the present article, at the same time stating whether the condition specified in paragraph 3 is fulfilled.

Article 14 (Entry into Force).

1. The Secretary-General of the League of Nations will draw up a procès-verbal when five ratifications or accessions complying with the condition laid down in paragraph 3 of Article 12 and in paragraph 3 of Article 13 have been received.

2. A certified true copy of this procès-verbal shall be transmitted by the Secretary-General of the League of Nations to all the Members of the League of Nations and to all non-member States mentioned in Article 12.

Article 15.

1. The present Convention shall be registered by the Secretary-General of the League of Nations ninety days after the date of the procès-verbal mentioned in Article 14. It will come into force on that date.

2. In respect of each Member or non-member State on whose behalf any instrument of ratification or accession is subsequently deposited, the Convention shall come into force ninety days after the date of the deposit of such instrument.

Article 16 (Duration and Denunciation).

1. The duration of the present Convention shall be for two years from its entry into force.

2. It shall remain in force for a further period of four years, and subsequently in respect of such Contracting Parties as have not denounced it at least six months before the expiry of the period.

3. The denunciation shall be effected by a written notification addressed to the Secretary-General of the League of Nations.

4. The present Convention shall cease to be in force as regards any High Contracting Party when, as a result of denunciation of the International Convention for the Campaign against Contagious Diseases of Animals, the High Contracting Party has ceased, such denunciation having duly taken effect, to be a party to that Convention.

5. The Secretary-General of the League of Nations shall inform all Members of the League of Nations and non-member States referred to in paragraph 1 of Article 12 of all notices of denunciation of the present Convention or of the International Convention for the Campaign against Contagious Diseases of Animals, denunciation of the latter being counted as denunciation of the present Convention.

Article 17 (Application to Colonies, Protectorates, etc.).

1. In the absence of a contrary declaration by one of the High Contracting Parties at the time of signature, ratification or accession, the provisions of the present Convention shall not apply to colonies, protectorates, overseas territories, territories under its suzerainty or territories in respect of which a mandate has been entrusted to it.

2. Nevertheless, the High Contracting Parties reserve the right to sign the Convention or to accede thereto, in accordance with the provisions of Articles 12 and 13, for their colonies, protectorates, overseas territories, territories under their suzerainty or territories in respect of which a mandate has been confided to them.

3. They further reserve the right to denounce the Convention separately, in accordance with the provisions of Article 16.

4. The present Convention shall not be applicable to colonies, protectorates, overseas territories, territories under the suzerainty of a High Contracting Party or territories in respect of which a mandate has been confided to it, if the International Convention for the Campaign against Contagious Diseases of Animals is not in force, or has ceased to be in force in so far as the said High Contracting Party is concerned in the above-mentioned countries.

Article 18 (Revision).

1. Conferences for the revision of the present Convention may be called with a view to making such changes therein as experience may have shown to be useful.

2. A conference for the revision of the present Convention shall be called by the Secretary-General of the League of Nations whenever so requested by not less than five of the High Contracting Parties.

The latter shall indicate succinctly the changes they propose and the reason for such changes.

3. In default of the unanimous consent of the High Contracting Parties, no demand for the calling of a conference for the revision of the present Convention within less than two years from the entry into force of the Convention or four years from the end of a previous conference for its revision shall be admissible.

4. The Secretary-General of the League of Nations shall prepare the work of conferences for the revision of the present Convention with the co-operation of the International Office for Contagious Diseases of Animals.

In Faith Whereof the above-mentioned Plenipotentiaries have signed the present Convention.

Done at Geneva the twentieth day of February, one thousand nine-hundred and thirty-five in a single copy, which shall be kept in the archives of the Secretariat of the League of Nations and of which a certified true copy shall be delivered to all the Members of the League and to the non-member States referred to in Article 12.

BULGARIA.

N. Antonoff.

FRANCE.

V. Drouin.

ITALY.

C. Bisanti.

LATVIA.

J. Feldmans.

THE NETHERLANDS.

Pour le Royaume en Europe
C. Van Rappard.

POLAND.

Titus Komarnicki.

ROUMANIA.

C. Antoniadu.

SWITZERLAND.

Flückiger.

CZECHOSLOVAKIA.

Rodolphe Künzl-Jizersky.

¹Translation:—For the Kingdom in Europe.

Certified true copy.

For the Secretary-General,
Legal Adviser of the Secretariat.

ANNEX.

Specimen Certificate of Origin and Freedom From Contamination.

I, the undersigned (name and qualification of the Government veterinary officer of the State of provenance) certify that the animal products hereinunder, described:

(weight)

(nature of goods).

makes as under:

consigned from (place of consignment)

by (name and address of consignor)

to (name and address of consignee)

in transport by (form of transport and, if transport is by water, name of vessel),

come from no district in which no anthrax, swine fever, foot-and-mouth disease or sheep-pox are prevalent in malignant or epidemic form, and comply with the conditions in respect of freedom from contamination laid down in Article 1 of the International Convention of.....

Done at.....on (date in full).

(Signature of veterinary surgeon, stating qualifications).

(Official stamp or seal).

GIPD—L155 IO of AR—7-5-38—750.

